IED STAFF REPORT

FEED USE AND FEED CONVERSION RATIOS FOR LIVESTOCK IN THE MEMBER COUNTRIES OF THE EUROPEAN COMMUNITY

INTERNATIONAL ECONOMICS DIVISION

ECONOMICS, STATISTICS, AND COOPERATIVES SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

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A summary of currently available data

compiled by

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Washington, D.C. 20250

January 1980

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ABSTRACT

The existence of a common policy on agriculture and a common external tariff suggests a much greater degree of homogenity in feed use and feed conversion ratios among member EC countries than is in fact the case. No systematic analysis of the methods of livestock production and feeding has yet been undertaken at the Community level. The available national data on feed use vary considerably in the quality and in the detail of their presentation. Information of feed conversion ratios is also quite variable, both as between countries and as between types of livestock. As far as future feed use is concerned, the cyclical nature of hog and poultry markets, in which the system of common support prices plays relatively little direct part, will continue to affect year to year demand for compound feeds. Since the prices of milk and beef are subject to direct market support, long-run supply of these products and consequently feed demand will be influenced to a much greater extent by decisions taken by the Community's Council of Agricultural Ministers. Absolute improvements in feed conversion ratios for intensively reared stock are, baring an unforeseen technical or genetic breakthrough, unlikely to equal those achieved over the past decade.

Key words: European Community; feed use; feed conversion ratios.

ACKNOWLEDGMENT

This report was prepared under the terms of a contract between the Bureau Europeen de Recherches and the Western Europe Branch, International Economics Division, Economics, Statistics, and Cooperatives Service, United States Department of Agriculture.

TABLE OF CONTENTS

/Cont.

/Cont.

LIST OF SOURCES

LIST OF TABLES

/Cont....

List of Tables

Cont/...

List of Tables

/Cont.....

List of Tables

/Cont.....

List of Tables

/Cont.....

List of Tables

/Cont.....

List of Tables

/Cont.....

List of Tables

/Cont.....

/cont....

List of Tables

/Cont.....

/Cont.....

List of Tables

/Cont....

List of Tables

GLOSSARY

balancer	- a composite of protein, minerals and vitamins used as a supplement.
cake	- oilseed cake and meal.
concentrates	- a mixture of cereals and protein/ mineral balancer usually processed into pellets or similar form.
draff	- waste.
D.M.	- dry matter.
feed unit	- 1 feed unit is the weight of the food-stuff which can replace the value of 1kg of e.g. barley without altering the nutritional value of the diet.
green currency	- the common prices guaranteed to farmers in European Currency Units (ECUs) are not calculated at the normal exchange rate between national currencies and the ECU, but at special exchange rates known as 'green currencies'.
green maize	- Maize harvested in an unopened state for stock feed.
hill farm	- farm having insufficient cropping land to overwinter calves/lambs or to fatten older cattle/sheep.

hogg	- yearling sheep.
maize	- corn.
monetary compensatory amounts (MCA's)	- border taxes and subsidies applied to the main agricultural products in the EEC to take account of differences in national exchange rates.
n.a.	- not available.
pig	- hog.
pigmeat	- pigmeat includes pork, which may be fresh or conserved, but uncured, as well as bacon and other cured products.
poultrymeat	- includes meat from chickens, turkey, duck, goose and guinea fowl.
starch equivalent	- fat producing quality of feed. One pound of starch leads to the deposition of .25 lbs of fat.
store cattle	- weaned cattle purchased at various ages for further fattening.
ton	- in all cases metric ton (2,204 lbs).

unit of protein	- digestible crude protein.
upland farm	- farm which has some cropping land available to overwinter calves/lambs or to fatten older cattle/sheep, but not to the same extent as a lowground farm.
V.A.T.	- Value Added Tax.

WEIGHTS, MEASURES, AND CONVERSIONS

The metric system of weights and measures is used in this report, unless otherwise indicated. The following are conversions to the U.S. system of weights and measures: 1 hectare is equal to 2.471 acres, 1 metric ton is equal to 2,204.6 pounds, 1 kilogram is about 2.2046 pounds, 1 litre to 1.0567 quarts, and 1 hectoliter is equal to 26.418 gallons.

Conversion of liveweight to meat:

Cattle = 55 per cent

Pigs = 76 per cent (60 per cent excluding lard)

Poultry = 72 per cent

1 egg = .05 kilograms

Measurements of feed intake, conversions

1 kg starch equivalent (SE) = 1.13kg TDN

1 kg TDN = 15.115 Megajules of Metabolisable energy (MJ.ME)

1.13kg TDN = 17.08 MJ.ME = 1kg SE.

FOREWORD

It is hoped that the data assembled in this study will contribute to a clearer view of likely trends in feed use by livestock in the European Community during the early 1980's. Our research has brought us into personal contact with individuals engaged in research (whether funded by governments, universities, farmers' and traders' associations, feed compounders or other private agencies) throughout the Community, as well as with officials in government departments and at the Commission of the European Communities. Such contacts have helped us to evaluate the written, including statistical, material available from those and other sources. We would like to thank all concerned for giving up their time to us.

Anyone making use of the material ought to be clearly warned of the wide variations of production conditions not only between the nine member countries of the European Community, but even within the countries, especially the larger ones, themselves. In particular, any temptation to view the Community in terms of a miniature United States must be avoided. The existence of a common policy on agriculture and a common external tariff may suggest to the outside observer a much greater degree of homogeneity than is in fact the case. It must be borne in mind that the first steps towards a common market for agriculture were not taken until 1962. In the six original member states it has been in full operation for just over eleven years, in the three states which joined later, for just over seven - of which the first five embraced a number of transitional elements. Although the spread of technical innovation in agriculture, which particularly affects feed conversion ratios, has been relatively rapid in Western Europe over the past twenty years, and in all Community countries

there has been a steadily increasing proportion of economically efficient livestock enterprises in which performance and costs are regularly monitored, such developments have tended to flow within national channels. Cross-border feed manufacturing enterprises, for instance, are still rare. Language differences remain a strong barrier to the flow of technical and economic information, and to the co-ordination of industrial and academic research in the livestock sector. Extension services, which vary much in quality between one country and another, necessarily operate on a national basis. The Commission, the EC's executive branch located in Brussels has maintained a steady effort to integrate research and distribute its findings more widely throughout the Community. This tends to be slowed down not only by translation problems, but by the bureaucratic procedures and shortage of funds and by having to enlist the interest and support of nine member governments with disparate viewpoints.

The small average scale of farm enterprise in most EC countries is also an obstacle to the spread of the newest techniques in livestock breeding and feeding. As will be evident from the tables in Annex 3, 80 per cent of dairy holdings in the Community have fewer than 20 cows. In Italy and Germany the proportion is even greater. 80 per cent of holdings with pigs also have fewer than 20 pigs each; in Italy barely 4 per cent have more than 20 pigs. On the other hand, over 80 per cent of the Communities pig population is on holdings with 150 or more pigs. In the case of poultry, for which comparable official statistics are unfortunately not available, partial evidence suggests that the concentration of layers, and particularly of broilers, into fairly large or very large units is a good deal more advanced. As far as pig and poultry production is concerned, therefore, the representativeness of the feed conversion ratios to be found in this review will be greater than those relating to beef and dairy cattle. This is perhaps no more than saying that pigmeat, eggs and poultrymeat lend

themselves more than beef and milk to large scale production. But the wide differences between member countries in the distribution of the size of livestock enterprises, and in the distribution of the livestock population between enterprises, is nevertheless a factor which needs to be kept in mind.

Although much progress has been made by the Statistical Office of the European Communities in co-ordinating and harmonising the agricultural statistics of the nine member countries, they are still largely concerned with production and first stage processing. No systematic analysis of the methods of livestock production and feeding has yet been undertaken at Community level. The available national data on feed use vary considerably in the quality and in the detail of their presentation. This reduces the possibilities for inter-country comparisons to a rather limited number of macro-economic statistics. Evidence of on-farm use of cereals and concentrate supplements and its split between different types of livestock, for instance, is non-existent in most countries. Information on feed conversion is also very variable, both as between countries and as between types of livestock. Broadly, as would be expected, ratios have been consistently calculated for the more intensive types of production (of pigs, chicken meat and eggs) that have become widespread, and in some countries predominant, during the past decade. As far as beef is concerned, methods of production remain so diverse, even within individual countries, and intensive raising in feedlots still accounts for such a small proportion of output, that it has proved much harder to establish any clear pattern of achievement. This is even more the case with milk, which outside the United Kingdom (the only country in which the average dairy herd exceeds 30 cows), the Netherlands and Denmark, is produced to a great extent in small, uncosted, and often technically backward, enterprises.

A general caveat needs to be entered about one aspect of the feed ratios presented in the evidence under review. The estimates are based essentially on technical and biological considerations. They take no account of economic factors such as the full feed "cost" of maintaining any breeding stock that may have been involved in the production of the basic unit of stock, e.g. day old chick or weaner piglet, being processed. Where, for instance, as in the case of piglets and layers, some allowance is made for feed to the parent stock, this is normally specified. So too is an allowance for mortality among the stock being processed.

The principal part of this report is taken up by a consideration, for each main type of livestock, of the evidence for feed use and feed conversion in each of eight member countries (Luxemburg being either inconsiderable or included with Belgium). We have endeavoured to obtain data that are representative of actual enterprises and not normative. Results from experimental farms are only included as a yardstick or as an indicator of possible future achievement on commercial farms. The unevenness of much of the data presented will be immediately apparent.

The final section projects a brief look into the future. As far as feed use is concerned, the cyclical nature of pig and poultry markets, in which the system of common support prices plays relatively little direct part, will continue to affect year to year demand for compound feeds. The prices of milk and beef being subject to direct market support, long-run supply of those products will be influenced to a much greater extent by decisions taken by the Community's Council of Agricultural Ministers. Whether the decision is temporarily to freeze nominal prices of products in "structural" surplus, or, in response to political pressures, to increase them each year, if only by relatively small percentages, the likelihood is that in real terms prices will decline, or at least remain unchanged. Dairy cow numbers (and that

predominant part of the beef cattle population issuing from dairy herds of dual purpose breed) will thus tend to be fairly stable. Any overall rise in beef cattle numbers will tend to be small, and any potential increase in feed use from such a rise largely multiplied by gradual improvements in feed conversion. No significant upward trend in total feed use in the Community of Nine is therefore to be anticipated. A policy decision also to reduce the real level of support price for cereals, on the other hand, would encourage a switch away from the high proportion of cereal substitutes which recent price relationships have encouraged compounders to incorporate in their various feeds.

Absolute improvements in feed conversion ratios for intensively reared stock are, barring an unforeseen technical or genetic breakthrough, unlikely to equal those achieved over the past decade. But, in countries with the least modernised production structures, ratios now being achieved for a minority of livestock will gradually extend to an increasing proportion of the total livestock population. Unless and until there is a substantial fall in the real cost of cereals, improvements in daily liveweight gain for beef cattle and in milk yields for dairy cows will be sought from still greater use of high protein cereal substitutes which bear little or no import duty as well as through better genetic performance. On those holdings not constrained by shortage of land, an additional aim will be the development of higher yields and more efficient feeding of green forage, both fresh and conserved. But this, too, will be a gradual process.

Having made these introductory generalisations, however, we would once again stress the caution with which they must be stated in view of the great diversity of production conditions within the European Community.

Since this report will be read on both sides of the Atlantic, we have

ventured to include at the beginning a brief glossary, which includes those English terms more generally used in Europe than in America.

Edmund NEVILLE-ROLFE

INTRODUCTION

1. Feed use

Since the early 1970's, the composition of the feeds used for livestock production in the European Community has altered considerably. The most notable change has been a decline in the use of cereals and a corresponding rise in the use of cereal substitutes. Since the peaks of 1972/73 and 1973/74 animal consumption of cereals of all types has fallen from 72 million tons in 1973/74 to 65.8 million tons in 1977/78. (See Table 1). As a proportion of total feed production, cereal use in the European Community dropped from 26.6 per cent in 1972/73 to 25.1 per cent in 1975/76. (See Table 12).

Table 1 : Total use of cereals for animal feeding, by member country, EC-9, 1970/71 - 1977/78

Country	1970/71	71/72	72/73	73/74	74/75	75/76	76/77	77/78
	'000 tons							
EC - 9	66517	67575	71135	72174	70157	67680	67036	65791
West Germany	15049	15294	15784	16602	16743	16518	16435	15873
France	15031	15474	16712	17218	17104	16085	16226	17416
Italy	10515	10661	10750	11485	10201	10853	11098	9347
Netherlands	3225	2611	3174	3440	3627	2934	2490	2595
Belgium/Lux.	2944	2782	2964	3299	3137	2718	2444	2095
United Kingdom	12906	13514	14024	12951	13002	11912	12458	11917
Ireland	1201	1379	1532	1234	1352	1261	1289	1285
Denmark	5626	5887	6195	5945	5261	5399	4596	5263
	1970/71 = 100							
EC - 9	100	102	107	109	105	102	101	101
West Germany	100	102	105	110	109	110	109	105
France	100	103	111	115	114	107	108	116
Italy	100	101	102	109	97	103	106	89
Netherlands	100	81	98	107	112	91	77	80
Belgium/Lux.	100	94	101	112	107	92	83	71
United Kingdom	100	105	109	100	101	92	97	92
Ireland	100	115	128	103	113	105	107	107
Denmark	100	105	110	106	94	96	82	94

Source : Commission of the European Communities, (EC 132).

Table 2 : Use of cereals for animal feed in the European Community, by type of cereal, 1977/78 [a]

Material	Germany	France	Italy	Netherlands	Belgium/Lux	United Kingdom	Ireland	Denmark	EC - 9	
					'000 tons					
All cereals[b]	15873	17416	9347	2595	2095	11917	1285	5263	65791	(72174)[c]
of which: domestic origin	12677	17416	4755	308	869	9423	n.a.	n.a.	n.a.	n.a.
of which: on farm where grown	9848	10011	3699	10	546	2911	n.a.	n.a.	n.a.	n.a.
Soft wheat	2776	4052	400	149	201	3099	62	116	10855	(11604)
of which: domestic origin	2332	4052	400	100	129	2740	n.a.	n.a.	n.a.	n.a.
of which: on farm where grown	2051	2640	270	nil	50	145	n.a.	n.a.	n.a.	n.a.
Oats and Summer cereal mixtures	3456	2015	465	55	223	680	124	259	7277	(9350)
of which: domestic origin	3243	2015	347	50	158	679	n.a.	n.a.	n.a.	n.a.
of which: on farm where grown	2836	1790	313	5	130	330	n.a.	n.a.	n.a.	n.a.
Maize grain	2301	5695	6569	1927	671	1723	212	220	19318	(22008)
of which: domestic origin	501	5695	3420	nil	30	3	n.a.	n.a.	n.a.	n.a.
of which: on farm where grown	189	1736	2528	nil	30	nil	n.a.	n.a.	n.a.	n.a.
Barley	6093	5204	1827	283	645	6334	849	4597	25832	(25937)
of which: domestic origin	5388	5204	526	118	492	3975	n.a.	n.a.	n.a.	n.a.
of which: on farm where grown	3820	3600	526	4	297	2436	n.a.	n.a.	n.a.	n.a.
Other cereals	34	181	70	141	272	52	38	3	791	n.a.

Table 2 : Use of cereals for animal feed in the European Community, by type of cereal, 1977/78 Continued

Notes: a Figures in brackets refer to EUR 9 production in 1973/74.

b Excluding rice.

c Includes rye and other cereals, but not rice.

Sources : Eurostat, 1979 (EC 136).

Commission of the European Communities, 1977, (EC 132).

The decline in the consumption of cereals is a consequence of substitution by manioc, processing wastes and oilcakes. Between 1974 and 1978, manioc imports into the Community rose from 2.1 to 6.0 million tons. At the same time the use of oilcakes, and particularly soya, also expanded considerably in each member country, accounting for 6.4 per cent of total feed use, 15 per cent of nitrogenous matter intake (EC 132, 1979), in 1975/76 (See Tables 1, 3, 12 & 13A).

Table 3 : Total use of oilcakes for animal feeding by member country, EC -9, 1970/71 - 1976/77

Country	1970/71	71/72	72/73	73/74	74/75	75/76	76/77	of which: Soya Beans 70/71	71/72	72/73	73/74	74/75	75/76	76/77
				000' tons							000' tons			
EC-9	13180	13671	14324	13884	14453	16502	17695	7109	7312	7994	8455	9644	10425	10785
W. Germany	4108	4216	4333	3996	4443	5190	5742	2133	2203	2248	2252	2634	2828	2972
France	2260	2287	2539	2491	2487	2836	3067	1305	1346	1506	1688	1846	2028	2063
Italy	1515	1705	1763	1966	1835	2083	1943	941	993	1176	1310	1409	1618	1654
Netherlands	1794	1980	1971	1764	2066	2057	2275	1100	1054	1057	1104	1409	1355	1411
Belgium/Lux.	1005	988	1023	1009	1073	1197	1253	499	503	602	647	747	777	765
United Kingdom	1342	1298	1496	1395	1193	1502	1624	483	532	696	766	810	921	953
Ireland	143	114	126	141	125	187	219	103	87	85	101	107	154	143
Denmark	1014	1083	1160	1077	1231	1450	1572	545	594	627	587	682	744	797
					1970/71 = 100									
EC-9	100	104	109	105	110	125	134	100	103	112	119	136	147	151
W. Germany	100	103	105	97	108	126	139	100	103	105	106	123	133	139
France	100	101	112	110	110	125	135	100	103	115	129	141	155	158
Italy	100	113	116	130	121	137	128	100	106	125	139	150	172	175
Netherlands	100	110	110	98	115	115	127	100	96	96	100	128	123	128
Belgium/Lux.	100	98	102	100	107	119	119	100	101	121	130	150	156	153
United Kingdom	100	97	111	104	89	112	121	100	110	144	159	168	191	197
Ireland	100	80	88	99	87	131	153	100	84	83	98	104	150	138
Denmark	100	107	114	106	121	143	155	100	109	115	108	125	137	146

Source : Commission of the European Communities, (EC 132).

These shifts in feed use are the result both of changing feeding patterns at farm level and of the price relationship between cereals and other feeds at national level. As farms have gradually become larger, more specialised and more efficient, producers have increased their use of purchased compound feed and reduced the amounts of own cereals fed on farm. Since 1970, compound feed production has expanded at an average rate of 7.2 per cent a year.

Table 4 : Production of compound feeds[a], EC-9, selected years.

Country	1970	1972	1973	1974	1975	1976	1977
				million tons			
EC-9	47.0	52.7	58.6	57.8	58.0	62.7	67.4
W. Germany	9.7	10.7	11.0	10.7	11.5	13.0	14.0
France	7.6	9.6	11.0	11.1	11.1	12.0	12.5
Italy	3.5	4.0	6.2	6.3	6.0	6.3	7.8
Netherlands	8.6	9.1	10.1	10.5	10.7	10.8	12.2
Belgium/Lux.	4.3	4.7	5.0	5.0	4.7	5.2	5.0
United Kingdom	9.7	10.8	11.2	10.3	10.2	11.1	10.8
Ireland	1.0	1.1	1.2	1.1	1.0	1.2	1.4
Denmark	2.6	2.7	2.7	2.7	2.9	3.1	3.7
				1970 = 100			
EC-9	100	112	125	123	123	133	143
W. Germany	100	110	113	110	119	134	144
France	100	126	145	146	146	158	164
Italy	100	114	177	180	171	180	223
Netherlands	100	106	117	122	124	126	142
Belgium/Lux.	100	109	116	116	109	120	116
United Kingdom	100	111	115	106	105	114	111
Ireland	100	110	120	110	100	120	140
Denmark	100	104	104	104	112	119	142

Notes: a Includes milk replacer feed for calves.

Source: FEFAC (EC 134).

While compound feed use has expanded, the feed composition has been changing. As a proportion of the energy supplied by concentrated feed in 1973/74, cereals represented 62.0 per cent, manioc 1.7 per cent and oilcakes 12.5 per cent, whereas by 1976/77 these percentages were 58.8, 2.3 and 15.0 respectively. (EC 132). Over this period the

use of cereals in industrially produced feeds declined by 3.6. per cent, the average rate of incorporation in compounds in 1977 being 42 per cent (See Table 5 below). Parallel to this, the use of oilseed and meal cake in compound feeds rose by 2.4 per cent to reach an average level of 21.3 per cent of compound feed production. (See Table 6 below). This is mainly due to variations in relative price levels. Member countries with strong currencies - West Germany, Belgium, the Netherlands and Denmark - have been able to import cereal substitutes and oilcakes relatively cheaply. Furthermore, artificially high 'green' rates are maintained in Germany and Benelux in order to shield farmers from the effects of revaluations of the market rates of national currencies. The consequent positive monetary compensatory amount (MCA) for cereals, inflating their price on domestic markets has created in those countries especially favourable conditions for imports of cereals substitutes. These attract no MCA's and carry low or nil duties. Thus the purchase price of manioc in West Germany has at times been as much as 40 per cent lower than in the United Kingdom, where, thanks to the non-devaluation of the 'green' pound, cereal prices remained for a long period in sterling terms, on average 25 - 30 per cent below the Community's common price level. Proximity to ports, conveniently located compounders, and efficient transport also make the use of imported feeds more attractive in Denmark, the Netherlands, Belgium, and Northern Germany. In the United Kingdom over 60 per cent of compounding capacity is located inland and internal transport is expensive. Transport of manioc to the compounder will frequently add £6.00 - £7.00 a ton to the port price.

Table 5 : Use of cereals in compound feeds, by member country, EC-9, 1973 - 1977

Country	1973	1974	1975	1976	1977
		'000 tons			
EC-9	26655	25808	25697	27926	28305
W. Germany	4385	4238	4006	4336	4460
France	5418	5339	5381	5902	6133
Italy	3180	3500	3320	4542	5026
Netherlands	3346	3349	3564	2836	2362
Belgium/Lux.	2227	2030	2100	1830	1785
United Kingdom	6079	5316	5806	6426	6392
Ireland	720	720	420	954	1015
Denmark	1300	1316	1100	1100	1132
		as a percentage of compound feed production (by weight)			
EC-9	45.6	44.7	44.2	42.7	42.0
W. Germany	39.7	39.7	34.9	33.1	31.8
France	49.3	48.0	48.4	48.0	49.1
Italy	51.3	55.1	55.4	61.3	64.3
Netherlands	33.2	31.9	33.4	24.9	19.3
Belgium/Lux.	44.3	40.9	44.4	35.7	35.9
United Kingdom	54.1	51.4	56.8	56.6	59.2
Ireland	58.8	66.4	41.2	77.3	74.4
Denmark	48.0	48.6	38.2	32.0	30.7

Source : Commission of the European Communities (EC 132).

Table 6 : Use of cake in compound feeds, by member country, EC-9, 1973-1977

Country	1973	1974	1975	1976	1977
			'000 tons		
EC-9	11071	11039	12150	14318	14373
W. Germany	3038	3050	3855	4475	4450
France	2099	2046	2169	2415	2350
Italy	975	1118	1063	1185	1050
Netherlands	1961	1920	2043	2193	2358
Belgium/Lux.	969	981	922	1116	1000
United Kingdom	1000	949	1028	1304	1455
Ireland	180	160	145	190	210
Denmark	850	815	925	1440	1500
			as a percentage of compound feed production (by weight)		
EC-9	18.9	19.1	20.9	21.9	21.3
W. Germany	27.5	28.6	33.6	37.2	31.7
France	19.1	18.4	19.5	19.6	18.8
Italy	15.7	17.6	17.7	16.0	19.2
Netherlands	19.5	18.3	19.1	19.3	19.2
Belgium/Lux.	19.3	19.8	19.5	21.8	20.1
United Kingdom	8.9	9.2	10.1	11.5	13.5
Ireland	14.7	14.8	14.2	15.4	15.4
Denmark	31.4	30.1	32.2	41.9	40.7

Source: Commission of the European Communities (EC 132).

The most rapidly growing sector of the compound feed market has been that for cattle. As both dairy and beef production have become more intensive, use of concentrates has risen. Between 1973 and 1977 consumption of compound feed for cattle went up by 7.9 per cent. The 1975/76 drought provoked as sharp increase in concentrate use,

and consumption has remained at a higher level since. Concentrate use has also increased in parallel with that of green maize and maize silage for the fattening of young bulls. Since 1972 green maize production in the Community has more than doubled. Total production for which data are available reached 101 million tons in 1977, compared with 50 million tons in 1972. By 1975/76 green maize accounted for 4.3 per cent of total feeds produced (See Table 7 below). Yields obtained have increased from an average 4680 kg per hectare in 1972 to 5720 kg a hectare in 1977. France, with a harvest of 45 million tons in 1977, is by far the largest producer.

Table 7 : Surface area, yields and production of green maize, EC-9, 1972 and 1977

Country	Surface area '000 ha		Yield[a] 100kg/ha		Production[a] '000 tons	
	1972	1977	1972	1977	1972	1977
EC-9	1209	2164	411	468	49672	101302
West Germany	285	539	435	475	12396	25631
France	579	983	399	460	23075	45264
Italy	276	410	395	474	10920	19411
Netherlands	29	110	505	505	1487	5535
Belgium	33	83	450	492	1497	4087
Luxemburg	3	5	500	456	149	238
United Kingdom	4	34	421	355	151	1196
Ireland	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Denmark	n.a.	2	n.a.	n.a.	n.a.	n.a.
		1972 = 100				
EC-9		179		114		204
West Germany		189		109		207
France		170		115		196
Italy		149		120		178
Netherlands		379		100		372
Belgium		251		109		273
Luxemburg		66		91		160

Note : a Yields and production figures as green material.

Source : Eurostat (EC 135 and EC 136).

While the area devoted to green fodder production of all kinds has remained stable (See Table 8 below) the areas devoted to lucerne, clover and clover mixtures have declined. In 1972 5.1 million hectares

were planted with lucerne; by 1977 this had fallen to 4.3 million hectares.

Table 8: Surface area, yields and production of green fodder,[a,b] by member country, EC-9, 1972 and 1977

Country	Surface area '000 ha		Yield 100 kg/ha		Production '000 tons	
	1972	1977	1972	1977	1972	1977
EC-9 - Total	55615	n.a.				
EC-9[d]	38208	n.a.	50.5	n.a.	193106	n.a.
West Germany[c]	1495	1415				
West Germany[d]	4732	4718	72.2	77.6	34147	36630
France	18435	18243	46.8	56.4	86319	102968
Italy[c]		544				
Italy[d]	9659	8746	37.8	42.0	36503	36737
Netherlands[c]	45	45				
Netherlands[d]	1351	1358[e]	85.3	87.7[e]	11529	11908[e]
Belgium[c]	567	528				
Belgium[d]	269	296	90.9	100.8	2445	2982
Luxemburg[c]	39	41				
Luxemburg[d]	44	47	57.7	66.1	254	311
United Kingdom[c]	11914	11730				
United Kingdom[d]	1993	1840	47.2	50.1	9409	9215
Ireland[c]	3347	n.a.				
Ireland[d]	975	n.a.	59.7	n.a.	5822	n.a.
Denmark	749	697	89.1	83.2	6678	5800[f]

Notes :
- a See separate table for products included in each country under this heading. Annex 2, page 185.
- b Yields and production in hay equivalents = 25 per cent of green material.
- c Areas for which production figures are not available.
- d Only areas for which production figures are available.
- e 1976 figures.
- f Eurostat estimate.

Source : Eurostat (EC 135 and EC 136).

As a consequence of the increase in indoor fattening of beef cattle there has been a large scale reduction (1.7 million hectares in the regions for which date are available) in the area used for permanent meadows and pastures. This decline in the importance of pasture has largely taken place in countries where an increasing proportion of feeds is purchased, i.e. the Netherlands, Belgium, Denmark and West Germany. In the first three countries purchased feeds now account for over 60 per cent of total feed production. (See Table 12).

Table 9 : Surface area, yields and production from permanent grassland[a], by member country, EC-9, 1972 and 1977

Country	Surface area '000 ha		Yield[b] 100 kg/ha		Production[b] '000 tons	
	1972	1977	1972	1977	1972	1977
EC-9 - Total	42161	n.a.				
EC-9[d]	25733	23999	42.5	n.a.	109446	n.a.
West Germany[c]	1415	1415				
West Germany[d]	3971	3790	69.1	72.0	27444	27270
France	13883	13074	39.6	46.0	55017	60099
Italy[c]	n.a.	423				
Italy[d]	5336	4805	18.4	17.6	9794	8474
Netherlands	1318	1239	84.4	n.a.	11120	n.a.
Belgium[c]	554	521				
Belgium[d]	183	169	83.8	88.3	1533	1490
Luxemburg[c]	39	41				
Luxemburg[d]	30	31	54.0	63.7	162	196
United Kingdom[c]	10351	10521				
United Kingdom[d]	1012	882	43.1	46.5	4375	4104
Ireland	3617	n.a.	n.a.	n.a.	n.a.	n.a.
Denmark	291	279	n.a.	n.a.	n.a.	n.a.

Notes :
a See separate table for products included in each country under this heading. Annex 2, page 186.
b Yields and production in hay equivalents = 25 per cent of green material.
c Areas for which production figures are not available.
d Only areas for which production figures are available.

Source : Eurostat (EC 135 and EC 136).

As livestock production has become more rationalised, use of labour - intensive feeds such as potatoes has fallen sharply. Total production of potatoes for animal feeding in the Community went down from 11.5 million tons in 1971/72 to 4.7 million tons in 1976/77.

Table 10: Potatoes used for animal feeding, EC-9, 1971/72 and 1976/77

	'000 tons	
Country	1971/72	1976/77
EC-9	11456	4731
West Germany	6407	2991
France	1865	319
Italy	500	380
Netherlands	688	213
Belgium/Lux.	488	33
United Kingdom	823	304
Ireland	583	490
Denmark	102	1

Source : Eurostat (EC 136).

Over the period under review little progress has been made in the search for new sources of protein. Between 1974 and 1977, oilseed production within the Community declined from 1.4 to 1.2 million tons.

Table 11 : Oilseed production in the European Community, EC-9, 1974 and 1977

Total oilseeds	Production[a]	
Country	'000 tons	
	1974	1977
EC-9	1381	1187
Germany	301	282
France	777	562
Italy	40	60
Netherlands	56	44
Belgium	8	8
Luxemburg	n.a.	n.a.
United Kingdom	59	148
Ireland	n.a.	n.a.
Denmark	141	83

Note : a Largely owing to unfavourable weather conditions, yields declined from an EC 9 average of 2002 kg per hectare to 1720 kg per hectare. Area planted remained constant at around 690 000 hectares. Of a total oilseed production of 1 187 000 tons in 1977, 953 000 tons were accounted for by rape and turnip rape.

Source : Eurostat, (EC 135 and EC 136).

No alternative crops with any significant impact on protein supply have been developed. Synthetic amino acids are still largely in the experimental stage, and are hardly likely to become of major importance before the late 1980's.

Table 12: Fodder production, by member country, EC-9, 1972/73 - 1975/76

1. Purchased feeds

Year	EC-9	West Germany	France	Italy	Nether-lands.	Belgium/ Lux.	United Kingdom	Ireland	Denmark
				Fodder units per cent					
Cereals[a]									
1972/73	26.6	26.9	22.8	32.0	20.5	28.2	29.0	10.6	46.6
1973/74	26.4	28.8	21.7	33.6	21.1	29.3	27.0	8.7	47.8
1974/75	26.3	28.0	23.2	32.1	20.9	27.3	27.6	9.3	41.1
1975/76	25.1	27.2	21.4	32.2	17.1	25.3	25.9	9.0	43.5
Other materials[b] of plant origin									
1972/73	2.5	4.4	0.9	1.7	9.4	5.4	1.1	1.3	0.8
1973/74	2.3	4.1	0.9	1.1	8.3	4.8	1.4	1.0	1.0
1974/75	2.6	4.2	1.1	1.4	9.4	7.2	1.3	0.7	1.0
1975/76	2.4	3.7	1.0	1.2	10.4	6.7	1.0	0.7	0.4
Milling by-products									
1972/73	2.4	1.7	1.3	5.6	3.4	5.6	2.6	0.7	0.3
1973/74	2.3	1.7	1.0	5.8	3.2	6.0	2.4	0.7	0.4
1974/75	2.3	1.6	1.1	5.8	3.2	5.3	2.4	0.6	1.1
1975/76	2.4	1.8	1.0	5.4	3.7	6.0	2.5	0.7	1.4
Oilcakes									
1972/73	5.4	7.4	3.5	6.0	11.5	8.8	3.0	0.9	8.4
1973/74	5.2	7.1	3.2	7.0	10.2	9.0	3.0	1.0	8.3
1974/75	5.6	7.8	3.5	7.0	11.3	9.6	2.6	0.9	9.5
1975/76	6.4	8.8	3.8	7.9	11.3	11.4	3.4	1.4	11.1
Other processing wastes									
1972/73	2.5	3.0	1.6	0.5	10.2	5.1	2.3	0.9	1.5
1973/74	2.6	3.3	1.5	0.5	10.0	5.4	2.5	0.9	2.1
1974/75	2.8	3.7	1.6	0.5	10.6	5.9	2.1	1.0	2.2
1975/76	3.2	3.4	1.9	0.6	12.7	6.9	2.4	1.0	2.5
Milk and milk products									
1972/73	2.3	1.8	3.5	1.4	2.7	2.0	1.4	3.6	2.6
1973/74	2.2	1.8	3.2	1.3	2.5	1.8	1.4	2.5	2.8
1974/75	2.2.	1.7	3.6	1.3	2.2	2.1	1.5	1.8	2.6
1975/76	2.3	1.8	3.5	1.4	2.7	2.5	1.5	1.7	2.7
Products of animal origin									
1972/73	0.9	0.6	0.6	0.2	4.4	1.6	1.0	0.2	1.1
1973/74	0.9	0.6	0.6	0.2	3.9	2.7	1.0	0.2	0.7
1974/75	1.0	0.8	0.7	0.2	3.7	1.9	1.1	0.2	1.1
1975/76	1.0	0.9	0.5	0.2	4.2	2.2	1.2	0.2	1.1
Total production of purchased feeds									
1972/73	42.6	45.9	34.2	47.4	62.2	56.8	40.3	18.2	61.4
1973/74	42.0	47.5	32.2	49.4	59.1	59.0	38.7	15.0	63.1
1974/75	48.8	47.8	34.8	48.2	61.3	59.3	38.7	14.5	58.5
1975/76	42.8	47.6	33.2	49.0	62.1	61.0	38.0	14.8	62.6

Cont./...

Table 12 : Fodder production, by member country, EC-9, 1972/73 - 1975/76 (continued)

2. Not normally marketed feeds.

Year	EC-9	West Germany	France	Italy	Nether-lands	Belgium/ Lux.	United Kingdom	Ireland	Denmark
				Fodder units per cent					
Root crops									
1972/73	3.3	5.9	3.5	1.1	1.3	2.9	1.6	1.5	7.4
1973/74	3.0	5.0	3.2	1.0	0.9	2.8	2.1	1.4	6.9
1974/75	3.1	4.9	2.7	1.1	0.8	3.4	2.1	1.3	11.9
1975/76	3.4	4.4	4.1	1.1	0.6	4.0	2.1	1.1	11.6
Green maize									
1972/73	2.7	2.9	4.8	4.5	1.1	2.3	0.0	---	---
1973/74	3.6	4.2	6.2	5.1	2.2	3.1	0.1	---	---
1974/75	3.9	4.4	6.5	6.1	2.9	3.3	0.2	---	---
1975/76	4.3	4.9	7.0	6.2	3.0	4.9	0.3	---	---
Other green fodder									
1972/73	1.7	---	1.3	9.5	---	---	0.1	0.1	---
1973/74	1.6	---	1.4	8.8	---	---	0.2	0.1	---
1974/75	1.4	---	0.5	9.7	---	0.6	0.2	0.1	---
1975/76	1.8	---	1.7	9.4	---	0.5	0.3	0.1	---
Meadows and pastures									
1972/73	47.7	42.1	54.4	34.8	34.2	35.7	57.3	79.6	25.5
1973/74	47.2	40.0	53.5	33.3	36.4	33.2	58.1	82.9	24.0
1974/75	46.6	39.6	53.6	32.2	34.3	31.6	58.0	83.6	22.9
1975/76	46.0	39.8	53.4	31.6	33.5	27.7	58.2	83.5	19.6
Straw and wastes									
1972/73	0.8	1.0	0.3	1.0	0.2	0.2	0.5	0.5	3.4
1973/74	1.3	1.1	2.1	0.9	0.2	0.2	0.6	0.5	3.7
1974/75	0.9	1.2	0.4	1.3	0.2	0.2	0.6	0.5	4.1
1975/76	1.0	1.1	0.4	1.4	0.2	0.2	1.0	0.5	4.2
Other forage crops									
1972/73	1.3	2.1	1.4	1.6	1.1	2.0	0.2	0.0	2.3
1973/74	1.3	2.1	1.4	1.5	1.2	1.8	0.2	0.0	2.3
1974/75	1.3	2.1	1.4	1.5	0.5	1.5	0.2	0.0	2.6
1975/76	0.9	2.2	0.1	1.3	0.6	1.8	0.2	0.0	2.0
Total production of non-marketed feeds[c]									
1972/73	57.4	54.1	65.8	52.6	37.8	43.2	59.7	81.8	38.7
1973/74	58.0	52.5	67.8	50.6	40.9	41.0	61.3	85.0	36.9
1974/75	57.2	52.2	65.2	51.8	38.7	40-7	61.3	85.5	41.5
1975/76	57.4	52.4	66.7	51.0	37.9	39.1	62.1	85.2	37.4
Total feed production									
1972/73	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1973/74	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1974/75	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1975/76	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes: a Includes rice
b. Pulses, potatoes, vegetable oil and fats, processed green fodder, manioc, other including sugar.
c. Includes beet leaf and tops.

Source: Eurostat, 1978 (EC 135).

Table 12 above summarises the developments outlined above and gives a percentage breakdown of the feeds used in the member countries of the European Community between 1972/73 and 1975/76. Table 13 summarises crop production in 1972 and 1977. Table 13A presents fodder supplies used in the Community in 1975/76 and 1976/77.

Table 13: Surface area, yields and production, principal arable crops, EC-9, 1972 and 1977[a]

Product	Surface area '000 ha		Yield 100 kg/ha		Production '000 tons	
	1972	1977	1972	1977	1972	1977
All cereals	26953	25853	38.3	39.6	103270	102389
Wheat	11090	10054	37.3	38.2	n.a.	38389
Rye and maslin	1159	1022	33.1	34.9	n.a.	3567
Barley	8611	9465	39.1	39.8	n.a.	37668
Oats and mixed grains other than maslin	3084	2480	39.9	31.7	10451	3850
Grain maize	2914	2713	46.8	57.2	13639	15513
Sorghum, millet, buckwheat and canary seed	95	119	27.6	32.9	262	390
Dried pulses	600.9	432.7	15.8	18.23	951.0	787.0
Potatoes	1511	1426	269	272	40671	38764
Sugar beets	1522	1804[c]	420	446	63882	80392
Fodder beets	979	n.a.	628	n.a.	61479	n.a.
Total oilseeds	612.2	690.4	20.0	17.2	12245.5	1187.7
Rape and turnip rape	486.1	499.3	22.2	19.1	1079.7	953.3
Green maize	1209	2164	409	468	49492	101302

Notes : a Data for 1977 is provisional.
b Includes swedes and turnips for the United Kingdom.
c Uncertain or estimated data.

Source: Eurostat (EC 135 and EC 136).

Table 13A : Products used for animal feeding in the EEC, 1975/76 and 1976/77.

Type of material	'000 tons 1975/76	1976/77
Cereals	67654	67036
Feed cake[a]	16537	17695
of which: soya	10425	10758
Animal meal	2117	2237
of which: fish	919	922
: meat and similar	1198	1315
Dehydrated fodder (lucerne etc.)	1744	1627
Milk powder (skimmed and other)	1190	1697
Legumes (field beans, etc.)	585	670

Note: a Excluding olive residues.
Source: Eurostat, 1979 (EC 132).

2. Feed conversion

Comparisons of the efficiency of feed conversion are made difficult by the different methods of measurement used in each country. It does, however, appear that average feed conversion rates achieved for all types of animal have improved considerably. It should be stressed that the figures presented are averages. Actual feed conversion will vary widely from farm to farm.

a. Pigmeat

As production units have become larger and more efficient, feed conversion for fattening pigs, from 20 to 100 kg liveweight, has improved to reach a European average of probably just under 3.60 kg feed per 1 kg liveweight gain. Experimental stations in all the major producing countries have already achieved feed conversion ratios of 2.8 : 1.

Table 14: Average feed conversion, fattening pigs, by member country of the European Community, 1970 and 1977 (20 - 100kg liveweight)

Country	Feed conversion kg feed per kg liveweight gain. 1970	1977
EC-9		
West Germany	3.82[a,b]	3.65[a,b]
France	3.75[a]	3.64[c]
Italy	n.a.	n.a.
Netherlands	3.74	3.61[d]
Belgium/Lux.	n.a.	3.50[e]
United Kingdom	n.a.	3.30[f]
Ireland	3.70	3.41[g]
Denmark	n.a.	3.27

Notes:
a author's estimate.
b 30 - 100 kg liveweight.
c 1976. Average from 28.4 to 103.0 kg liveweight. Standard error was estimated to be 0.27.
d 20 - 95 kg liveweight.
e for pork; 3.50 for bacon.
f 1978, estimated by author.
g feed units per kg liveweight. 1 feed unit equals the fodder value of 1 kg of barley. Average from 27 to 65 kg carcass weight.

Sources:
U. Hamm (G 69)
Instituut Technique du Porc (F 41)
Landbouw-economisch Instituut(NL 102/115)
Buyle (B 5)
Nix (UK 123)
Kearney (IRL 83)
Landsudvalget for Svineavl og-produktion (DK 14)

b. Poultrymeat and Eggs

During the past ten years, chicken meat and egg production has become highly intensive in all member countries of the Community, except Italy, where it is confined to certain parts of the North and Ireland. Production units are generally on a large scale, achieving feed conversion rates of nearly 2.0 : 1 for broilers to a liveweight of around 1.45 kg, and around 2.90 : 1 (for 1 kg weight of eggs) for layers.

Table 15 : Average feed conversion, broilers, by member country of the European Community, 1970 and 1977

Country	Feed conversion kg feed per kg liveweight gain	
	1970	1977
W. Germany[a]	2.30	1.90[b]
France	n.a.	1.90[c]
Italy	n.a.	2.50[d]
Netherlands[e]	2.07	1.97[f]
Belgium/Lux.[g]	2.23	2.12
United Kingdom	n.a.	2.20[h]
Ireland[i]	n.a.	2.20
Denmark	2.27	2.05

Notes:
a to a final weight of 1.50 kg liveweight in 1970 and 1.45 kg in 1975/76
b 1975/76
c to a final weight of 1.4 kg liveweight.
d to a final weight of 1.6 kg liveweight
e to a final weight of 1.31 kg livweight in 1970 and 1.46 kg liveweight in 1977/78
f 1977/78
g to a final weight of 1.44 kg liveweight in 1970 and 1.60 kg liveweight in 1977
h for Great Britain, per bird sold at 8 weeks
i to a final weight of 1.422 kg liveweight in 1970 and a final weight of 1.474 kg liveweight in 1977.

Sources:
U. Hamm (G69)
Chabbert(F 40)
Unione Nazionale dell 'Avicoltura(I 92)
Landbouw-economisch Instituut (NL 102)
De Groote (B 7)
Nix (UK 123)
Landsudvalget for Fjerkrae (DK 14)

Table 16 : Average feed conversion, layers, by member country of the European Community, 1970 and 1977

Country	Feed conversion kg feed per kg eggweight 1970	1977
W Germany	4.1[a]	3.50[a]
France	n.a.	3.00[b]
Italy	n.a.	n.a.
Netherlands	2.84[b]	2.71[b]
Belgium/Lux.	2.88[c]	2.72[c]
United Kingdom	n.a.	2.76[d]
Ireland		
Denmark	3.49	2.97

Notes:
a Untypically high, includes feed for parent stock and subsistence.
b Author's estimate
c White egg layers. Medium weight brown egg layers achieved feed conversion rates of 3.13 in 1970 and 3.05 in 1977.
d Author's estimate assuming an average egg weight of 60 grams.

Sources: As for Table 15.

c. Beef and Dairy

The wide variety of feeding methods and feeds used for beef and dairy cattle make it impossible to compare average levels of feed conversion in the different member countries. Very roughly, feed conversion for bulls fattened intensively to a liveweight of around 530kg is 4300 starch equivalents per kg liveweight gain in Belgium, the Netherlands and West Germany. In France feed conversion for intensive production of bulls is around 6 kg dry matter per kg liveweight gain using silage and concentrates. In Italy feed conversion on the largest feed lots to a liveweight of just under 500 kg (starting at 133 kg liveweight) is 12.24 kg feed per kg of liveweight gain. (See glossary).

As intensive production of young bulls has become more important, average feed conversion rates have improved. However, with average slaughter weights rising in most member countries, improvements in feed conversion have not always been apparent. Except in Germany, and the Netherlands no data are available on average feed conversion for dairy cattle. The highly variable quality of pastures and the different quantities fed to individual animals make estimation difficult. For Germany Hamm estimated the average production feed requirements per kg of milk to be 264 starch units, or 57.7 units of protein (in grams).

BELGIUM

1. Background

In 1977 a total of 759,000 cattle and 257,000 calves were slaughtered in Belgium. (A detailed breakdown for comparable production in 1970 and 1974 is given in Table 17).

Production of beef and veal has declined slightly since 1974 falling to 271,000 tons in 1977 (302,000 in 1974). Consumption per head has shown a corresponding decline from 30.7kg per person in 1974 to 28.4 kg in 1977.

In the last ten years there has been a notable increase in the proportion of bulls used for beef production and a corresponding decline in the relative importance of steers and calves.

2. Feed use

Since 1964 slaughter weights for all types of animals have risen considerably (from 520 to 612 kg liveweight for bulls). Table 18 below shows the main types of beef production system in use in Belgium at present.

Table 17 : Number of cattle slaughtered, by type, Belgium, selected years

Year	Cattle slaughtered Total	Steers		Heifers		Cows		Bulls		Calves	
		Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
1955	964,727	110,423	11.4	180,280	18.7	237,950	24.7	114,141	11.8	321,933	33.4
....											
1964	947,297	123,475	13.0	179,244	18.9	229,388	24.2	151,894	16.0	263,296	27.8
....											
1970	1,047,312	103,219	9.8	194,449	18.6	266,757	25.5	201,837	19.3	281,050	26.8
1971	1,077,606	102,263	9.5	202,750	18.8	267,937	24.9	219,553	20.4	285,103	26.4
1972	1,012,166	126,254	12.5	181,689	18.0	224,781	22.2	212,173	21.0	267,269	26.4
1973	980,071	133,579	13.6	165,544	16.9	231,734	23.6	221,149	22.6	228,065	23.3
1974[a]	1,105,773	91,364	8.3	190,516	17.2	288,469	26.1	292,643	26.5	242,781	21.9

Note: a In 1974 the size of the dairy herd was 1,003,309 dairy cows; suckler cows 75,079.

Source : Buysse et al (B 1).

Table 18 : Beef production systems, Belgium

Fattening Cattle	Production System	Type	Market weight (kg)	Age (months)	Feedstuff [a]
		Veal calves	160 - 180	3 - 4	Dairy products
	I. Intensive	1. Young bulls (type : Baby-beef)	450 - 475	12 - 13	Concentrates (cereals, dried pulp...) minimum roughage
	II. Semi - intensive	2. Fattening bulls	525 - 575	15 - 18	Rearing [b], grassland, grassland products maize silage, fodder beets, dried pulp, some hay, concentrate
		3. Fattening bulls	575 - 650	20 - 24	Rearing, grassland, grassland products, (meadow hay, grass silage), beet tops + pulp, fodder beets, maize silage, concentrate
Young		4. Young steers	± 600	± 24	Rearing, grassland, grassland products, sugar beet tops, ensiled pulp, maize silage
		5. Heifers	450 - 600	± 24	Rearing, grassland, various roughages
		6. Young cows (calved once or twice)	550 - 600	30 - 45	Grassland, various roughages, concentrate
	III. Extensive	7. Older steers	600 - 700	30 - 36	Rearing, grassland (2 to 3 pasturing seasons), various roughages
Older		8. Older cows	500 - 650	-	Grassland, various roughages possibly supplemented by cereals.
		- Culled breeding bulls	-	-	
		- Suckler cows	-	-	
		- Double muscled (heifers, bulls, steers)	± 700	20 - 24	

Note: a Underlining denotes principal feed.

b Feed given during rearing period.

Source : Buysse et al (81).

Intensive feeding of young fattening bulls (baby-beef) to a liveweight of 450 - 475 kg in 12 - 13 months has become uneconomical in recent years, as the result of high calf prices, and of a market preference for heavier animals.

Semi-intensive feeding systems are increasingly being used for fattening bulls, young steers, as well as some heifers and young cows. Depending on the time of birth (that is, autumn- or spring-born calves), feeding up to a liveweight of 250 - 300 kg is either off pasture, for autumn - born calves, or partially indoors, for spring - born calves. Spring-born calves will be fed on maize or grass silage or dried forage, supplemented with concentrates. Finishing is usually based on farm-produced dough-dent maize silage or dehydrated beet pulp, and sometimes on fodder beets. These feeds will be supplemented by concentrates (See Table 18 above). usually 0.75 - 1.0 kg of concentrates per day for 100 kg liveweight.

Extensive feeding, based on pasture in the summer and various farm products in winter, is still used for older steers, but this kind of production is of declining importance. Cows culled from dairy herds are also fed extensively on grass or roughages, supplemented by cereals.

Bull calves from suckler beef herds are not a significant part of beef production at present. The number of suckler cows remains small (75,079 in 1974). Calves from this type of herd are usually finished intensively on maize silage or dehydrated beet pulp plus concentrates up to a liveweight of 550 - 600 kg.

Consumption of compound feed for both beef and dairy cattle rose sharply, as a consequence of the drought in 1975/76, and has remained at a higher level since (See Table 19 below).

Table 19 : Production of compound feed for cattle, Belgium, 1971 - 1977

	1971	1972	1973	1974	1975	1976	1977
	'000 tons						
Dairy cattle	347	386	442	382	401	537	524
Beef cattle :							
growing	152	140	166	153	157	193	195
finishing	204	240	291	260	249	322	283
Total	703	766	899	795	807	1052	1002

Source : Samengestelde Veevoeders (B 2).

Production of compound feed for calves has risen from 104,000 to 129,000 tons since 1971 (See Table 20 below).

Table 20 : Production of compound feed for calves, Belgium, 1971 - 1977

Type of Feed	1971	1972	1973	1974	1975	1976	1977
	'000 tons						
Milk replacers	61	64	66	56	53	57	60
Creep feed	6	6	6	6	6	8	7
Finishing	37	50	56	54	56	62	62
Total	104	120	128	116	115	127	129

Source : Samengestelde Veevoeders, (B 2).

3. Feed conversion

Under experimental conditions bulls fed intensively with complete dry feeds achieved feed conversion rates of 3.24 starch equivalents per kg liveweight gain (feeding from 48.1 kg up to 463.8 kg). Bulls fattened intensively on a base of dehydrated beet pulp achieve feed conversion rates of 3.12 starch equivalents per kg liveweight gain (feeding from 145.7 kg to 478.2 kg)

The results from semi-intensive feeding vary according to the type of feed used and the length of the feeding period. For bulls carried to a liveweight of between 525 - 575 kg (See Table 21), 4.40 starch equivalents per kg liveweight gain have been achieved for feeding based on maize silage ; 4.51 kg of liveweight gain for feeding based on dehydrated sugar beet pulp, and between 4.10 and 4.24 for feeding based on fodder beets and varying amounts of concentrates.

Table 21 : Results achieved for fattening bulls during finishing, Belgium

Basic feed	Fodder beets [a]	Fodder beets [b]	Fodder beets [c]	Maize silage [d] (13-17cm) 22.8% d.m.	(60 - 65% cereals + straw)
Number of bulls	30	7	173	39	10
Initial weight (kg)	277.7	296.9	257.8	277.5	252.2
Final weight (kg)	574.2	543.3	585.4	565.5	535.8
Daily gain (g)	1375.2	1232.0	1357.0	1172.0	1370.0
Feed intake (kg/day) :					
concentrate	4.55	2.48	2.89	4.05	9.03
fodder beets	21.25	29.67	-	-	-
dried beet-pulp	-	-	6.73	-	-
meadow-hay	0.37	-	-	-	-
maize silage	-	-	-	17.68	
Feed efficiency/kg gain :					
concentrate	3.30	2.01	2.13	3.45	6.60
maize silage	-	-	-	15.08	-
fodder beets	15.45	24.1	-	-	-
dried beet-pulp	-	-	4.96	-	-
meadow-hay	0.27	-	-	-	-
starch value	4.24	4.10	4.51	4.40	4.29
feed units	6.06	5.86	6.45	6.29	6.13

Notes: a Plus one per cent concentrates per kg liveweight.

b Plus 2.5 kg of concentrates per day.

c 70 per cent dried pulp and 30 per cent concentrates.

d Plus one per cent concentrates per kg liveweight.

Source: Buysse et al (B 1)

Given the great diversity of feeding methods, the above figures for feed conversion must be treated with caution. Feed conversion rates for the average producer will be considerably higher, and no estimates are available.

BEEF AND DAIRY

DENMARK

1. Background

Since Denmark's accession to the Common Market in 1973 total cattle numbers have stabilised at 3.1 million head. In 1977 263,000 tons of beef and veal were produced. Roughly two-thirds of this production is exported, domestic consumption in 1977 being only 89,000 tons. Since the early 1960's per capita consumption has fallen from 18.5 kg (carcass weight) per year to 17.5 kg in 1977.

Nearly all Danish beef production comes from dual purpose breeds. Carcasses from culled dairy cows account for 43 per cent of total production, bulls accounting for another 41 per cent.

Table 22 : Production of beef and veal, Denmark, 1974

Type of Cattle	Beef production total		Average carcass
	tons	per cent	weight (kg)
Bulls	10400	4.39	300
Young bulls	94300	39.79	186
Bullocks	4200	1.77	285
Culled cows	101800	42.95	254
Heifers	23000	9.70	219
Veal calves	3100	1.31	101
Baby calves	200	0.09	14
	237000	100.00	

Source: Larsen et al (DK15).

Young bulls are kept inside on tie-stalls during the feeding period, since pasture is generally not used for beef animals. Feedlots for beef production are not used.

2. Feed utilisation

Since 1970 consumption of compound feeds for cattle has risen uninterruptedly, experiencing a sharp rise during the 1975/76 drought. (See Table 23)

Table 23 : Production of compound feeds for cattle, Denmark, 1970-1978

Item	Average 1970/71 - 1974/75	1975/76	1976/77	1977/78
		1000 tons		
Production of compound feed	844	1391	1709	1743
of which protein low	325	602	856	818

Source: Landøkonomisk Oversigt, 1978 (DK11)

Cereals account for 13 per cent of feedstuff consumption, root crops, especially fodder beets, 20 per cent, grass crops and straw 40 per cent (See Table 24). The use of these materials for cattle feed has, however, been declining as increasing quantities of imported high and low protein feeds have been substituted. Protein feeds, especially soya, now account for over 15 per cent of the total feed used.

Table 24 : Consumption of feed by cattle, Denmark, 1976/77

Type of feed	Consumption	
	Million feed units [a]	per cent
Cereals	986	13.4
Bran, pulses, draff etc.	202	2.7
Manioc, molasses etc.	397	5.4
Milk and milk products	225	3.1
Protein feeds	1136	15.4
Root crops, including tops	1478	20.0
Grass crops	2528	34.4
Straw	408	5.6
Total	7360	100.0

Note: a 1 feed unit equals the fodder value of one kg of barley

Source: ibid.

3. Feed conversion

No studies describing feeding practice for the average producer are available. Figures for feed requirements and feed conversion are, however, comparable to those achieved in W. Germany.

BEEF AND DAIRY

FRANCE

1. Background

In 1977 a total of 4.1 million cattle and 3.4. million calves where slaughtered in France. A detailed breakdown for comparable production in 1974 and 1975 is given in Table 25 .

Table 25 : Beef and veal production, France, 1974 and 1975

Type of animal	Number of cattle slaughtered				Average Carcass weight
	1974	1975	1974	1975	1974
	'000 head		per cent		kg
Total cattle	4467	4599	100	100	
of which :					
Total females :	2733	2969	61.2	64.6	288
of which :					
- heifers	646	188	14.5	4.1	
- young cows (0-4 broad teeth)		639		13.9	
- culled cows	2087	2142	46.7	46.6	
Total steers :	1041	1020	23.3	22.2	
of which :					
- young steers	n a	69	n a	1.5	
- growing steers	n a	510	n a	11.1	
- adult steers	n a	441	n a	9.6	
Total bulls :	693	610	15.6	13.3	
of which :					
- young bulls (no broad teeth)	305	312	6.9	6.8	301
- growing bulls (1-4 broad teeth)	283	216	6.3	4.7	349
- mature bulls	105	82	2.4	1.8	391
Calves - Total	3251	3233	100	100	98.8
of which :					
- males	n a	2073	n a	64.3	
- females	n a	1160	n a	35.6	

Source : Béranger (F20)

There is a notable preponderance of female cattle, which is due to the preference for cull cows for beef. The high proportion (over 40 per cent) of all calves born which are slaughtered for veal, and the still relatively low proportion of bull beef produced in France, are also characteristic. Of the total national breeding herd, approximately 75 per cent of cows produce milk for sale and/or processing. The remaining 25 per cent, of which over half are of beef breed are used for suckling calves, either for veal or for sale as weaners for fattening. Table 26 gives the distribution of the main dairy, beef and dual-purpose breeds.

Table 26 : Distribution of the principal breeds of cows and heifers, France, 1974 (per cent)

Dairy Breeds : 72 of which :		
	French Friesian	33
	Normandy	27
	Pie Rouge	10
Beef Breeds : 14 of which :		
	Charolais	9
	Limousin	3
Dual purpose, hardy breeds and crossbred cows : 14 of which :		
	Salers	1.7
	Maine-Anjou	1.4
	Brown-Swiss	1.5

Source : Béranger (F20).

A relatively small proportion of the dairy herd is crossbred with beeftype bulls, usually Charolais or Limousin.

Beef is produced from many different types of animal and by various methods

of feeding and production. In recent years there has been an increase in bull beef production, from 50,000 head in 1965 to over 500,000 in 1974 and 1975, accompanied by a rise in average carcass weight from 275 to 310 kg and in slaughtering age from 13 to 15-16 months. Veal production has shown a tendency to decline, with bull beef production taking its place (F20).

2. Feed use

Since the drought of 1975/76 the use of compound feed for beef and dairy cattle has risen by over 30 per cent (See Table 27).

Table 27 : Compound feed production for cattle, France, 1972 - 1977

	1972	1973	1974	1975	1976	1977
			'000 tons [a]			
Milk replacers	699	757	736	708	799	816
Dairy cows	841	1050	919	988	1347	1345
All other cattle	443	594	530	528	686	670
Total	1983	2401	2185	2224	2832	2831

Note : a Rounded to the nearest thousand tons.

Source : S.N.I.A. (F38).

Nevertheless only 20 per cent of the dairy herd and an even smaller proportion of the beef herd use compound feeds to any significant extent. The close link between beef and milk production makes it impossible to separate the proportions of fodder crops and forages used for each type of production. In the case of beef a brief description of the different methods of production and feeding of cattle in France is necessary to an

understanding of feed use and feed conversion. Even so the classification given provides only a broad outline of the principal methods used in a large country where there is very considerable diversity.

a) Intensive feeding

Between 10 and 15 per cent of beef production is based on intensive feeding of bulls. The bulls are slaughtered at between 13 and 18 months, after indoor fattening for a period of between 6 and 10 months. Calves from dairy herds start fattening after a suckling period of 4 - 5 months; beef calves start the fattening period aged between 6 and 9 months. Dairy calves are slaughtered between 13 and 15 months giving a carcass weighing 270 - 320 kg. Beef calves and crossbred cattle are slaughtered at 15 - 18 months, with a carcass weight of 290 - 380 kg.

Approximately 60 per cent of the bulls fattened in this way use maize silage (1500 kg D.M. to slaughter) supplemented with 1000 kg of cereals and/or oilseed meal and cake and urea. This method is increasingly used in Brittany and other areas where maize can easily be grown. Roughly 10 per cent of production is based on beet or grass silage. 20 per cent of bulls are fattened with pelleted rations containing 50 - 60 per cent dehydrated lucerne (low quality surplus from lucerne factories) and 40 - 50 per cent dehydrated sugar beet pulps (2000 kg D.M. to slaughter)supplemented with 500 kg of cereals and/or cake and urea. Other feed types used are dehydrated grass or maize together with a high proportion of grain or complete dry feeds based on cereals. Both of these types of feed have become increasingly uneconomic because of the high

price of cereals.

The herd sizes involved in intensive feeding are generally small (no more than 150 - 200 head per holding). Feeding is tied to crop production. Therefore this type of feeding cannot be equated with a feedlot system.

b) Semi-intensive feeding

Semi-intensive feeding accounts for roughly 25 per cent of beef production.

This system is used for the production of steers, heifers, and, to some extent, bulls, which are slaughtered between the ages of 18 and 24 months. They are finished indoors for a period of 3 - 5 months. At present this form of production is not practised widely in France, but it is tending to replace the production of older cattle as the use of maize silage for winter growth and fattening increases. Calves generally have a good growth rate from birth to nine months (approximately 900 grams liveweight gain concentrates per day). After four months they receive concentrates (2 - 3 kg a day) or maize silage.
In winter, when they are not on pasture, they receive maize silage, or hay and concentrates, or grass silage and concentrates,to maintain a growth rate of up to 400 grams per day. After a season on pasture, steers reach 550 - 600 kg liveweight. There are two forms of basic ration.

1) Maize silage fed ad libitum (1200 kg D.M.) supplemented by 600 - 700 kg of grain plus protein cake or urea.

2) Beet pulp (600 kg D.M.) and good grass silage, supplemented by 300 kg of grain plus protein cake or urea.

Of the total feed intake 50 - 65 per cent is derived from roughage and 30 - 50 per cent from maize silage, beets, grains or concentrates.

c) Extensive feeding

Used for the production of steers and heifers slaughtered between the ages of 2.5 and 3.5 years. Principally in use for Charolais beef herds, Normandy dairy cow herds and those beef or dairy herds in Western France where crossbreeding takes place. From birth to the age of 6-9 months calves either suckle their dam and graze or are fed on artificial milk (30 - 45 kg of powder), hay and concentrates. From 6 - 9 to 36 months they are given hay during the winter and pasture during the summer which results in relatively low daily weight gain in winter (0 - 500 grams) and a compensatory growth on grass during two summers (600 - 800 grams (See Table 28).

Table 28: Example of growth performance and feed use for a steer of three years finished indoors, France.

Period from	Liveweight (kg)	Age (mths)	Length of period	Daily live-weight gain (grams)	Daily feed	Total feed for period
15 Nov.	290	8.5	5	100	Hay (7.5 kg)	1125 kg
15 April	300	13.5	7	750	Pasture	1180[a]
15 Nov.	460	20.5	5	0	Hay 7.5 kg	1425 kg
15 April	460	25.5	7	750	Pasture	1430[a]
15 Nov.	615	32.5	4	900	Maize silage (9.3 kg)	1120 kg
					Soya Cake (0.7 kg)	85 kg
15 March	720	36.5			Maize 0.8 kg	95 kg

Note : a Forage units

Carcass weight : 405 kg

Average daily liveweight gain : 510 grams a day

Total feed used :	Maize silage	1120 kg	(dry matter)
	Hay	2550 kg	gross
	Soya cake	85 kg	gross
	Maize	95 kg	gross
	Pasture	2610	forage units

Source : ONIBEV (F37)

On some rich pastures in Normandy the summer gain may reach 1100 - 1200 grams, in which case they are generally fattened for no more than one six month summer period. During autumn finishing, feeding will take place at troughs and daily liveweight gains will be relatively high. During finishing 40 per cent of animals will be fed on a basis of maize silage, 30 per cent sugar beet pulp and 30 per cent on other feeds. Of the total feed intake, 50 - 65 per cent comes from roughage either grazed or conserved and 35 - 50 per cent comes from maize silage, beets, grain or concentrates. Carcass weight is highly variable, ranging from 320 - 450 kg for steers and 270 - 350 kg for heifers.

d) Culled cows

After their last lactation cows culled from dairy herds are finished with the same type of ration as they receive during lactation. Some 20 per cent of the dairy herd at present use concentrates more extensively, although always less than 1000 kg per cow per year. (F20)

Culled cows, adult steers and heifers account for approximately 60 per cent of beef production in France (See Table 25).

3. Feed conversion

Feed conversion for intensive production of bulls is approximately 6.9 kg D.M. to 1 kg liveweight gain using a base of dehydrated fodder crops, and 5.9 kg D.M. to 1 kg liveweight gain using silage.

4. Feed use, veal

As will be seen from Table 29 , in France the annual increase in average carcass weight has effectively compensated for the decline in numbers slaughtered, maintaining total output at approximately 375,000 tons carcass weight of veal.

Table 29 : Veal production, France : evolution of the structure of slaughterings and average carcass weight (1970 - 1975)

Year	sex	slaughterings		Av. carcass weight in kg
		in 1000 head	per cent	
1970	M	2595.0	64.8	88
	F	1410.1	35.2	85
	T	4005.1	100.0	87.2
1971	M	2486.7	63.6	90.9
	F	1425.2	36.4	87.8
	T	3911.9	100.0	89.7
1972	M	2139.6	64.1	94.6
	F	1197.9	35.9	91.6
	T	3337.5	100.0	93.5
1973	M	1933.3	63.0	96.5
	F	1131.6	36.9	96.5
	T	3064.9	100.0	98.5
1974	M	2058.9	63.4	100.1
	F	1186.2	36.5	96.4
	T	3245.1	100.0	98.8
1975	M	2053.8	63.5	98.6
	F	1175.8	36.4	95.1
	T	3229.6	100.0	97.3

M - Males F - females T - Total

Source: CNIBEV (537)

There are two principal feeding methods, feeding with milk replacers, and single suckling.

Feeding with milk replacers, being dependent on local availability and low transport costs of the raw materials, is concentrated in the west, and to a lesser extent in the north and east of France. The calves are fed skimmed milk powder, enriched with animal or vegetable fats. Nitrogenous materials, including soya meal, make up 20 - 25 per cent of the feed, and fats around 15 per cent during the growth phase and 25 per cent during finishing. On an experimental feed lot a feed conversion of 1 : 1.72 has been achieved (weight at start 52.3 kg liveweight, at slaughter 188.4 kg, average daily liveweight gain during the 12 week period being 1258 grams). Feeding with milk replacers accounts for two-thirds of French veal production, single suckling for the remaining third (F37).

GERMAN FEDERAL REPUBLIC

(WEST GERMANY)

1. Background

In 1977 a total of 4.54 million cattle and 679 thousand calves were slaughtered in the Federal Republic.(G 62). As will be evident from Table 34 below , there has been a considerable increase in the number of bulls fattened over the last thirteen years. For the same period the proportion of steers and heifers slaughtered appears to be declining. The number of cows for slaughter is subject to fluctuation. Projections for 1978/79 appear to confirm this trend. It has been estimated that during 1978/79,4.750 million head of cattle will be slaughtered, of which 2.315 million heifers and cows and 2.43 million bulls and steers (G 66). Cows and heifers, which account respectively for 34 per cent and 17 per cent of beef production in the Federal Republic, normally do not receive special fattening rations. They are slaughtered because of low yield, sterility or disease. Systematic beef production is concentrated on young bulls, which account for almost half of total beef output (G 57).

Calves for fattening are derived almost exclusively from dairy herds of dual-purpose breeds. German Friesians (Black and White) (36 per cent), German Fleckvieh (Simmental) (36 per cent) and German Red and Whites (Red Friesians) (18 per cent), account for 90 per cent of these breeds. Commercial cross-breeding (beef breedsxdual purpose) is at present of no significance (G 57).

Per head consumption of beef and veal has declined slightly since 1970, to 23.7 kg in 1977, (24.6 in 1970).

2. Overall feed use by cattle

Cattle raising is based mainly on permanent grassland and arable forage and succulent feed. Permanent grassland still accounting for over 40 per cent of total utilisable agricultural land in the Federal Republic. Around 70 per cent of the feed used is produced on the farms themselves. In recent years silage production has become of growing importance, but the greater part of the grass is still conserved as hay for winter feeding. The trend in arable forage is away from potatoes, lucerne, clover and grass clover mixtures and towards maize silage and beet tops. Maize silage in particular produces higher yields and is easier to handle (G 57). (See Table 30 below). Between 1970 and 1976 feeding of maize silage increased by 126 per cent or 18 per cent a year.

Table 30 : Area devoted to forage crops, West Germany, 1972 - 1977

Type of material	1972	1973	1974	1975	1976	1977[a]
			'000 ha[b]			
Grass and maize silage	285	346	380	430	463	545
Sugar beet[c]	331	352	369	426	440	427
Fodder beet	287	268	254	239	227	216
Potatoes	503	481	467	415	415	396
Permanent grassland[d]	3971	3939	3864	3865	3854	3854
Oilseeds	106	107	110	90	95	104
TOTAL	5503	5493	5444	5465	5494	5572

Notes : a Provisional
b Rounded to the nearest 1000 ha
c Tops and pulp
d Including hay

Source : Zentrale Markt und Preisberichtstelle (G 63).

Parallel to the use of maize silage, compound feed use for both dairy and beef cattle has risen from 8.6 per cent of the total ration in 1971/72 to 13.8 per cent in 1976/77 (See Table 31), As the use of concentrates for dairy cattle and intensive feeding of young bulls has increased the proportion of cereals in the ration has tended to decline.

Table 31 : Feeds used by cattle, all types, West Germany, 1971/72 - 1976/77

Type of material	1971/2	1972/2	1973/4	1974/5	1975/6	1976/7
			'000 tons grain equivalent [a]			
Grains	2731	2910	3374	3064	2832	2191
Potatoes	70	87	81	93	65	45
Other vegetables [b]	3371	3121	3222	3233	3275	3080
Green matter and hay	17845	18350	19596	19208	19464	19761
Straw [c]	318	308	312	315	320	689
Concentrates [d]	3347	3490	3243	3595	4368	4878
Milk of all kinds	1319	1175	1113	1122	1104	1077
Total	29001	29441	30941	30630	31428	31629
of which in the form of compound feed [e]	2494	2970	2644	2981	3709	4375
			per cent			
Grains	9.4	9.9	10.9	10.0	9.0	6.6
Potatoes	0.2	0.3	0.3	0.3	0.2	0.1
Other vegetables [b]	11.6	10.6	10.4	10.6	10.4	9.8
Green forage and hay	61.5	62.3	63.3	62.7	62.0	62.5
Straw [c]	1.1	1.0	1.0	1.0	1.0	2.2
Concentrates [d]	11.6	11.9	10.5	11.7	13.9	15.4
Milk of all kinds	4.6	4.0	3.6	3.7	3.5	3.4
Total	100.0	100.0	100.0	100.0	100.0	100.0
in the form of compound feed	8.6	10.1	8.5	9.7	11.8	13.8

Notes :
- a See grain equivalent key, Annex 1, Page 184.
- b Including beet leaf and top, potato and vegetable wastes.
- c Different estimating base for 1976/77.
- d Bran, pulses, manioc, oilcake, fish and meatmeal molasses, processing wastes, lucerne meal.
- e In 1976/77 just under 10 per cent of compound feed production was used for calves.

Source : Futterwirtschaft, 1978 (G 56).

3. Main beef production systems

These can be broadly divided into four categories (See Table 32):

a) High level indoor feeding of bulls up to between 475 and 550 kg liveweight. Roughly 40 per cent of bulls are fattened in this way.

b) Finishing of lean cattle after pasturing. Finishing takes place on the basis of maize silage or beet leaf and top silage in areas with much arable land, and with grass silage in areas with a high proportion of grassland. Concentrate usage during the finishing period will vary between 1.25 and 4.0 kg per animal per day, depending on the quality of the base ration used. Maize silage is usually fed along with roughly 2 kg of concentrates per animal per day.

c) Summer fattening on pasture of steers and older bulls. Some 13 per cent of bulls and almost all steers are finished on pasture. Animals are thus maintained in a store condition during the winter on a low level of concentrate consumption. For calves born in the spring, concentrates are given in the first year at a rate of 1 - 1.5 kg per day. For animals born in the autumn, concentrates are fed at a rate of 2.5 kg per day during the first winter. This type of production is restricted to Schleswig - Holstein in the north.

d) Fattening of heifers. Average daily liveweight gains, slaughter weights and lengths of production for selected systems are shown in Tables 32 & 33.

Table 32 : Selected methods of beef production, W. Germany

Beef and Dairy

Fattening Period	Item	Unit	Fattening of Heifers			Indoor fattening of Bulls					Pasturing	
			without calving indoor	with calving pasture	with calving indoor	High Feeding Concentrates	High Feeding Maize	Finishing after Pasturing Maize	Finishing after Pasturing Grass	Finishing after Pasturing S.B. Leaf	Bulls	Steers
Rearing	From..to			November - January		At any time		November - January			November - February	
	Time	Day		45		45		45			100	
	Weight stage from..to	kg		70 - 100		75 - 105		75 - 105			48 - 120	
	Average daily gain	g		700		700		700			700	
Pre Pasturing	From..to			January - May				January - May			February - May	
	Time	Day		135				120			80	
	Weight stage from..to	kg		100 - 195				105 - 235			120 - 180	
	Average daily gain	g		700				1100			750	
Pasturing	From..to			May - October				May - September			May-Oct	May-Oct
	Time	Day		160				155			160	160
	Weight stage from..to	kg		195 - 280				235 - 320			180-290	180-280
	Average daily gain	g		550				550			700	625
Indoor Feeding	From..to		Oct-June	Oct-May	Oct-May			Sept-April	Sept-May	Sept-April	Oct-April	Oct-April
	Time	Day	225	210	210	304	400	180	210	180	180	180
	Weight stage from..to	kg	280-450	280-385	280-410	105 - 475	105-550	320-550	320-550	320-550	290 - 350	280 - 330
	Average daily gain	g	750	500	600	1220	1120	1275	1100	1275	330	290
Pasturing	From..to			May-Aug	May-Oct						April-Aug	April-Oct
	Time	Day		95	145						130	190
	Weight stage from..to	kg		385-450	410-520						350-500	330-480
	Average daily gain	g		700	750						1150	800
Indoor Feeding	From..to				Oct-Jan							Oct-April
	Time	Day			95							180
	Weight stage from..to	kg			460-515							480-480
	Average daily gain	g			800							-
Pasturing	From..to											April-Sept
	Time	Day										130
	Weight stage from..to	kg										480-600
	Average daily gain	g										1000
Fattening period/Final liveweight			18.5/450	21/450	26/515	11.5/475	14.5/550	16.5/550	17.5/550	16.5/550	21.5/500	33.5/600

Source: Röhr et al. (G 57)

It should be noted that there are many variants to the systems outlined in Table 32 above. Bulls may be fattened with potato pulp; indoor fattening of bulls may take place with grass silage etc. Both the length of the production period and/or the final liveweight may vary considerably. The methods of production recorded are based on purchased calves. In Southern Germany calves are normally purchased at 70-75 kg. but in the North at 45 - 50 kg.

Table 33 : Development of liveweight and concentrate consumption under different fattening systems, West Germany

	Liveweight range (kg)	Average Daily Gain (g)	Age at end of period (mo)	Average intake of concentrates kg/head/ day	total kg/head	per cent of total net energy
High Feeding System						
Maize silage						
a) Simmental	125 - 550	1000	18	1.6	680	25
b) Friesians	125 - 500	950	17	1.6	635	27
Beet top silage	125 - 500	880	18	2.5	1065	45
Finishing lean cattle						
Restricted feeding, indoors	125 - 170	750	6	2.0	120	60
On pasture	170 - 295	680	12	-	-	-
Finishing after pasturing						
Maize silage						
a) Simmental	295 - 600	1250	20	2.0	490	25
b) Friesians	295 - 550	1200	19	1.8	380	23
Beet top silage	295 - 550	1100	19.5	3.2	730	44
Grass silage	295 - 550	1050	20	3.5	850	50

Source : Röhr et al (G 57)

All systems have a common rearing method up to a liveweight of 100 - 110 kg. During the common 16 week rearing period calves are given colostrum and whole milk for 1 - 2 weeks and subsequently fed milk replacer together with hay and special concentrates. (G 57).

At present under 1 per cent of bull production takes place in intensive beef lots, although this percentage is gradually rising. These bulls are started on a high energy (66 - 68 starch units) low protein (14 per cent) diet at 120 kg and raised to a slaughter weight of between 475 and 500 kg. Under this method a feed conversion ratio of 1 kg of feed to 5 kg of liveweight gain is possible. No cereals are fed because the price is too high. The composition of the feed used is entirely determined by the price relationships of the principal feedingstuffs. Depending on price, some combination of any of the following will be fed : maize gluten, copra meal or expeller which is high in energy, some tapioca, sugar beet and factory wastes, molasses, palm oil meal, bran, green meal, soyabean meal, sunflower meal, rape meal. Broadly, a 16 per cent protein feed requires no soya meal, copra and maize gluten being used instead. 30 per cent protein feed would require soya, rapeseed, green fodder, and groundnut meal. Since excessive amounts of protein have tended to be fed to cattle in the past, soya use has decreased recently and sunflower and rapeseed to some extent substituted. The introduction of synthetic amino acids has also made possible a lower protein feed content in compound feeds of this kind (G 57).

4. Feed conversion

It will be appreciated that, given the variety of feeding methods described above, it is not possible to give any precise value for average feed conversion. Tables 34 - 38 present approximate data on feed use and feed conversion on the average farm in the Federal Republic. Owing to the variability of production techniques no standard feed composition could be assumed.

a) Bulls Since the late sixties average final weight for bulls at slaughter has risen from 505 to 533 kg. At the same time feed conversion has improved slightly from 640 grams of protein to 635 grams of protein per kg of meat. This is largely a result of more intensive methods of production. The average age at slaughter of bulls is estimated to be 17.5 months.

Table 34 : Feed requirements for beef production, bulls, West Germany, selected periods

	Unit	Average 1965/66 - 69/70	Average 1970/71 - 74/75	1975/76
BULLS				
Average numbers slaughtered.	1000 head	1606	1951	2084
Final weight	kg	505	530	533
Weight at birth	kg	42	42	42
Animal losses[a]	per cent	1.4	1.4	1.4
Net meat production[b]	1000 tons	744	952	1023
Feed requirements per kg of meat	Units of starch (g)	4100	4110	4050
	Units of protein (g)	640	640	635
Total feed[c] requirements for bulls, West Germany	Units of starch (1000 tons)	3093	3967	4201
	Units of protein (1000 tons)	483	618	659

Notes : a Mortality under normal breeding conditions. Percentage relates to average final weight.

b Number of animals slaughtered x average final weight minus the number of animals slaughtered x average weight at birth.

c Includes feed used on lost animals

Source : U. Hamm (G 69).

b) Steers Steers are generally fed extensively by traditional methods (pastured in summer and housed in winter) and there has been no significant improvement in feed conversion.

Table 35 : Feed requirements for beef production, steers, West Germany, selected periods

STEERS	Unit	Average 1965/66 - 69/70	Average 1970/71 - 74/75	1975/76
Numbers slaughtered	1000 head	104	84	88
Average final weight	kg	496	500	504
Average weight at birth	kg	42	42	42
Animal losses[a]	per cent	1.3	1.3	1.3
Net meat production[b]	1000 tons	47	38	41
Feed requirements per kg of meat	Units of starch(g)	4500	4500	4500
	Units of protein (g)	670	670	670
Total feed[c] requirements for steers, West Germany.	Units of starch	216	171	189
	Units of protein (1000 tons)	32	25	28

For Notes see previous Table 34

Source : ibid.

c) Heifers As methods of production have improved the feed requirement per kg of meat has gone from 665 grams of protein in the late 1960's to 660 grams in 1975/76, while the average final weight has increased from 430 to 443 kg liveweight.

Table 36 : Feed requirements for beef production, heifers, West Germany, selected periods

HEIFERS	Unit	Average 1965/66 - 69/70	Average 1970/71 - 74/75	1975/76
Slaughtered heifers	1000 head	823	814	792
Average final weight	kg	430	443	443
Average weight at birth	kg	41	41	41
Animal losses[a]	per cent	1.2	1.2	1.2
Net meat production[b]	1000 tons	320	327	318
Feed requirements per kg of meat	Units of starch(g)	4450	4450	4400
	Units of protein (g)	665	665	660
Total feed [c] requirements for steers, West Germany.	Units of starch (1000 tons)	1442	1473	1417
	Units of protein (1000 tons)	215	220	213

For notes see above, Table 34

Source: ibid

In line with the increase in cattle numbers total feed requirements in terms of both protein and starch have risen considerably.

Table 37 : Total feed requirements, beef production, all types of animals, West Germany, selected periods

Item	Unit	Average 1965/66 - 69/70	Average 1969/70 - 74/75	1975/76
Total feed[c] requirements for beef production, West Germany.	Units of starch (1000 tons)	4751	5611	5807
	Units of protein (1000 tons)	730	863	900

Notes : c Includes feed used for lost animals.

Source : ibid

5. Feed conversion, veal calves

For calves (See Table 38 below) it should be noted that the final weight at slaughter has changed considerably, from 113 kg liveweight in the period 1965 - 70, to 143 kg liveweight in 1975 / 76. Since the rate of feed conversion has declined proportionately to the length of the fattening period, little technical progress is apparent. At present, i.e. 1976/77, the feed requirement for 1 kg of liveweight gain is 1480 units of starch or 348 grams of protein.

Table 38 : Feed requirements for veal production, West Germany, selected periods

Item	Units	Average 1965/66 - 69/70	Average 1970/71 - 74/75	1975/76
For domestic use				
Slaughtered calves	1000 head	1398	835	683
Average final weight	kg	113	135	143
Average weight at birth	kg	41	41	42
Animal losses[a]	per cent	1.8	1.8	1.8
Net veal production[b]	1000 tons	100.66	78.49	68.98
Feed requirement per kg of meat[c]	Units of starch (g)	1470	1500	1510
	Units of protein (g)	344	345	345
Total feed requirement for veal production	Units of starch (1000 tons)	150	120	106
	Units of protein (1000 tons)	35	28	24
Feed requirement for exported surplus of calves[d]				
Exported calves	1000 head	243[e]	410	250
Average liveweight of exported calves	kg	69[e]	71.5	72
Average weight at birth	kg	41	41	41
Feed requirement per kg of growth	Units of starch (g)	1150	1140	1135
	Units of protein (g)	273	270	270
Total feed requirement for exported calves	Units of starch (1000 tons)	8	14	9
	Units of protein (1000 tons)	2	3	2
Total feed requirement for veal production	Units of starch (1000 tons)	158	134	115
	Units of protein (1000 tons)	37	31	26

Notes :
a Mortality under normal breeding conditions. Percentage relates to average final weight.
b Number of animals slaughtered x average final weight minus the number of animals slaughtered x average weight at birth.
c Includes feed used on animal losses.
d Only registered by the Federal Statistical Office since 1966.
e Average of years 1966/67 - 1969/70.

Source : ibid.

6. Dairy Cows

The 1970's have seen an almost unbroken rise in average milk yields, due to increased use of concentrates per cow and improving breeding.

Table 39 : Production of milk per cow, per year, West Germany, 1970 to 1976

Year	Average annual yield (litres)	Annual increase in average yield (litres)	Annual increase in average yield (per cent)
1970	3867		
1971	3900	+ 33	+ 0.9
1972	3949	+ 49	+ 1.3
1973	3890	- 59	- 1.5
1974	3934	+ 44	+ 1.1
1975	3997	+ 63	+ 1.6
1976	4105	+108	+ 2.7

Source : Arbeitsgemeinschaft Deutscher Rinderzüchter (G 49)

The figures above are based on figures from recorded herds and estimates for the unrecorded ones. In 1976, 42.5 per cent of all milk cows' results were recorded. For those cows which were not recorded, the average result was 3590 kg of milk per year and for those continuously monitored the average result was 5062 kg of milk per year. Over the period 1970 - 1976, the feed required to produce a fixed output of milk has declined. At the same time total feed required per animal per year has risen from 2739 starch units between 1965 and 1970 to 2856 starch units in 1975/76. (See Table 40 below).

Feed production for milk is at present largely concentrated on farm, 70 per cent of total feed being green matter, hay and grass or maize silage. The value of such feed will obviously vary from year to

year as a consequence of rainfall and general weather conditions. Data on feed conversion can therefore only be based on results of concentrate feeding (feed grains (oats and barley), dried sugar beet pulp and compound feeds). It will be seen from Table 31 that although the level of concentrates fed has risen, the ratio of 70 per cent grass and silage to 30 per cent other feeds has remained stable. This is a consequence not only of higher yields of grassland, but of the cost of bought-in feeds, and the fact that milk production is concentrated on areas of pasture where the farmer has no alternative uses for his land. Although the potential of animals is underexploited, improvements will only take place if the pressure of costs forces farmers to rationalise their production, become more aware of the value of pasture, and put their own fodder basis to better use.(G69/G79).

Table 40 : Feed requirements for milk production, West Germany, selected periods

Item	Unit	Average 1965/66 - 69/70		Average 1975/76
No of milking cows	1000 head			
Average annual milk production per head	kg			
Subsistence feed required per cow per day [a]	Units of starch(g)	2900		
	Units of protein (kg)			
Production feed requirement per kg milk [b]	Units of starch(kg)			
	Units of protein (kg)			
Subsistence feed requirement per cow per year	Units of starch(kg)	1059		
	Units of protein (kg)	110		
Additional production feed requirement per cow per year	Units of starch (kg)	988		
	Units of protein (kg)	216		
Additional feed required for "steaming up" prior to calving	Units of starch (kg)	546		
	Units of protein (kg)	85		
Additional feed required for in-calf period	Units of starch (kg)	146		
	Units of protein (kg)	32		
Total feed required for milk production per cow per year	Units of starch (kg)	2739		2856
	Units of protein (kg)	443		468
Total feed required for milk production	Units of starch (1000 tons)	16031		
	Units of protein (1000 tons)	2593		

Notes : a For a cow with a liveweight of 540 kg periods).

b With 3.8 per cent fat.

Source : U. Hamm (G 69)

IRELAND

1. Background

The most recent available census figures (December 1977) indicate that about a quarter of all cows are of beef breed. Up to 1975 almost the whole progeny of these cows and of dairy cows not required as herd replacements was reared for beef. During the past three years an export trade of live calves to continental EEC countries has, however, been built up. Veal production remains negligible. Since at least 80 per cent of the dairy herd calves in the spring and produces milk off summer grass (plus concentrates) mainly for the product market, a large proportion of beef tends to be finished simultaneously off autumn grass, at 20 or 32 months.

2. Feed use

Data are rather sparse. Since 1970 production of all compound feedstuffs has evolved as follows :

Table 41: Production of compound feedingstuffs, Ireland, 1970-77[a]

Year	Total	Cattle feeds	Pigs feeds	Poultry feeds	Milk replacer	Mixtures[b]
			'000 tons			
1970	1013.3	156.4	579.3	242.7	22.4	6.7
1971	1101.0	155.5	635.6	258.2	34.6	9.7
1972	1151.1	237.9	605.3	261.1	29.8	8.3
1973	1204.0	291.2	588.0	269.1	28.8	14.8
1974	1069.6	285.5	487.2	251.9	20.9	8.9
1975	1009.7	333.8	392.8	237.0	25.7	5.9
1976	1214.7	430.9	479.6	253.8	31.6	4.5
1977	1368.3	564.6	474.9	267.4	39.1	4.0

Notes: a The category sheep and horse rations given in the source has been omitted from the Table.

b The category is given as "meal and flake admixtures" in the source, but no description is provided.

Source: Department of Agriculture (IRL 80) April 1978, p.16.

It will be noted that over the period 1970 to 1977 the proportions of compounds destined for the different types of livestock have altered. Cattle feeds have become more important, rising from 16 per cent of total in 1970 to 43 per cent in 1977, with much of the increase occurring after 1974. This can be partly explained by summer droughts and by an active extension programme. It will also have been due to the more favourable price ratio of output to input prices, especially for milk, and, except for 1974, when very large quantities had to be sold to intervention, for beef resulting from accession to the EEC.

Two customary systems of mainly grass-fed beef production from spring-born calves from the dairy herd were identified by Harte (IRL 81)

Table 42: Liveweight (kg) of beef cattle at various stages, Ireland.

Months of age:		8	13	20	24	32
System	Birth	(end of grass season)	(end 1st winter)	(end 2nd grazing season)	(end 2nd winter)	(end 3rd grazing season)
			kilogrammes			
1	38	200	280	440	550	-
2	38	180	240	400	400	500

Source: Harte (IRL 81) p.68.

A small proportion of cattle (less than 15 per cent) would be carried on through a third winter, and sold at 3 years, or off grass at 3½ years in their fourth fall.

The progeny of single suckling herds, born in February-March would be slaughtered at not more than 24 months, or earlier, at the end of their

second winter at 14-16 months, to take advantage in each case of the higher winter or early spring prices. For this reason too, and because of the abundance of summer grass, intensive raising of beef, mainly on concentrates, to 18-20 months is not much practised in Ireland. There has traditionally been a demand for heavier carcasses by wholesalers, exporters and processers. Retail, or wholesale/retail, butchers play a much smaller part than in the United Kingdom. Also calf prices tend to be high relative to beef prices. Harte concludes that "high calf prices and low carcass weight do not make economic sense", thus favouring the more extensive and leisurely fattening systems noted above.

The raw materials used as a basis for the compound feeds listed in Table 41 are given below.

Table 43: Estimated total quantities of feedingstuffs available for animal feed, Ireland, 1973-1977[a]

Raw Material	1973	1974	1975	1976	1977
			'000 tons		
Coarse grains and wheat offals:					
wheat	31.7	55.6	93.4	14.3	27.3
barley	742.6	703.9	724.0	681.5	762.5
oats	147.8	154.4	159.5	130.3	122.6
maize	368.1	179.7	230.0	307.8	284.6
milo(sorghum)	101.1	68.3	75.6	142.5	74.7
wheat offals	135.9	102.9	103.0	118.9	105.2
Protein feeds:					
soya meal	79.2	120.0	112.9	153.4	146.6
groundnut meal	9.9	7.0	10.3	18.6	45.1
cotton seed meal	12.6	5.4	7.5	8.2	9.7
linseed meal[b]	2.3	0.6	0.8	0.7	6.3
meat and bone meal	20.5	27.0	33.1	31.7	28.7
fish meal	13.2	11.8	12.1	16.2	13.8
other plant protein feeds	5.1	5.1	4.5	4.8	13.6
Miscellaneous feeds:					
molassed sugar beet pulp(dried)	124.2	127.4	86.6	129.6	136.6
sugar beet pulp (wet)	6.7	7.8	12.1	10.4	18.0
brewers' and distillers' grains	22.9	87.0	79.5	72.4	92.0
seaweed meal	3.6	2.8	2.8	2.6	2.4
grass meal	14.7	12.1	12.7	10.7	6.6
separated milk (mn.gal)	18.5	6.5	2.9	3.6	5.7
whey (mn.gal)			51.5	62.7	86.7

Note: a The data include the ingredients used in compound feeds.
b In 1977 linseed meal had been replaced by rape seed meal.

Source: Department of Agriculture, (IRL 80) May 1974 p.5, June 1975 p.15, April 1976 p.6, April 1977 p.14 and April 1978 p.18.

The decline, or relative stagnation, in the use of cereals, and the marked increase in the use of imported meals and miscellaneous feeds since Ireland's accession to the EEC reflects the sharp increase in the price of cereals resulting from progressive adoption, during the period, of the full level of common prices.

3. Feed conversion

Data on feed conversion are even more sparse than on feed use. No enterprise studies from which estimates of coefficients could be made are currently available for beef or dairying (IRL 83). As regards fattening on pasture, Harte (IRL 81) cites experimental conditions of high fertiliser application, producing 12000 kg of dry matter per hectare, under which liveweight gains of 1000 kg per hectare were obtained during an eight-month grazing season (April to November) for animals of an initial liveweight of 280 kg. At a stocking rate of 6.25 head per hectare (2.5 per acre) this would represent a gain of 160 kg per animal, as suggested under System 1 in Table 42 . Since the yield of unfertilised pasture could be as low as 7000 kg of dry matter, it is clear that the average achieved for Ireland as a whole would be a good deal lower.

ITALY

1. Background

During the 1960's and into the 1970's beef consumption per head rose. As a consequence partly of economic recession and partly of government measures (e.g. higher rate of V.A.T.) to discourage imports of meat that were seriously burdening the balance of payments, consumption has since fallen. It was 24.3 kg per head in 1978, falling steadily after reaching a peak of 27.8 kg per head in 1973. At the same time, the national herd has decreased from a total of 9,563,000 head in 1969 to 8,568,000 head (including 2.9 million dairy cows) in 1977. Despite the attempts to discourage them, imports of fresh and frozen beef, as well as live cattle, have proved necessary to balance the shortfall in internal supply. In 1977 these consisted of 1.89 million head of cattle and 323,000 tons of fresh or frozen beef. Given a total consumption of beef and veal of 1.37 million tons and domestic production of 864,000 tons, imports account for roughly 40 per cent of total demand. The big volume of imports of live animals has been principally due to the setting up of numerous large beef feedlots. These turn out 600,000 head of cattle per year.

2. Feed use

Production of compound feed for cattle increased slowly up to 1972, declined from 1973 to 1975, then rose sharply again as a consequence of the drought and has remained at a higher level since then. (See Table 44).

Table 44 : Production of compound feed for cattle, Italy, 1970-1977

Year	Production '000 tons
1970	1345
1971	1409
1972	1570
1973	1330
1974	1183
1975	1127
1976	2185
1977	2358

Source: FEFAC (EC 133)

In contrast to other members of the European Community, permanent meadow and pasture account for less than a third of the total utilized agricultural area. Forage production covers just under half of the total productive area, although since 1968 the area devoted to forage crops, especially green fodder, has been declining. There is a marked regional split. Forage crop production is concentrated in Northern and Central Italy, forming part of the farm rotation. In the South and Islands, except for a few irrigated zones, forage is derived mainly from permanent grassland and temporary leys.

Beef is produced partly from home-bred calves (1.8 million head in 1975) and partly by fattening imported calves (1.1 - 1.2 million head a year). In the first case, production is generally in small herds on family farms of under 5 hectares. In Northern Italy feed on these units consists mainly of alfalfa, or hay, and maize. The stock are usually housed in summer and winter. In Central and Southern

Italy hay is used with other crops such as broad beans. Here animals are frequently grazed on pasture in winter and on wheat stubbles after harvest in summer. Feeding and breeding methods are highly variable and, except for a minority of intensive enterprises, the results achieved are not quantifiable. Beef production can be broadly divided into four main categories. (See Table 45)

Table 45 : Domestic production of beef and veal, Italy, 1975

(Figures in brackets refer to further production from animals which are imported)

	tons		per cent contribution to domestic production
Veal	70,000	(6,500)	9.7
Young bulls:			
(a) Traditional beef breeds	75,000		10.4
(b) 'Barley beef'	63,500	(7,500)	8.8
(c) Traditional, semi-intensive	90,000		12.4
(d) Feed lots, intensive	125,000	(45,000)	17.2
Bulls and oxen	142,300		19.6
Dairy cows	158,700		21.9
	724,500	59,000	100.0

Source: Istituto per le Ricerche e le Informazioni di Mercato e la Valorizzazione della Produzione Agricola (IRVAM) (I 90).

(a) Traditional beef breeds (Marchigiana, Chianina, Romagnola) are single-suckled and then fed with hay and concentrates up to a carcass weight of 250-320kg. In 1975 this method accounted for 450,000

head of cattle, yielding a total carcass weight of 75,000 tons

(b) 'Barley beef'. Calves of dairy breeds are imported at 40 - 50 kg and raised to a liveweight at slaughter of 300 - 400 kg. Up to 1000 kg reconstituted milk is fed, together with a low percentage of concentrates. After the cattle have reached 100 kg liveweight the level of concentrates fed is stepped up and fed with crushed grain and protein complements. The feeding is ad libitum. In 1975 there were 435,000 head in this category, of which 310 - 320,000 were from the national herd, the remainder imported.

(c) Traditional fattening methods are used principally in Central and Southern Italy. Of the various techniques used, two main types can be identified: cattle finished 'light' at 450 - 500 kg liveweight, aged 14 - 16 months, and those finished at 600 - 650 kg, aged 18 - 20 months. The feeding is semi-intensive, largely forage and concentrates, with the amount of concentrates used rising over time in a not very systematic manner.

(d) Intensive feeding based on specialised feed lots using principally cereals and silage. These consist of already weaned animals of 150 - 200 kg finished at 450 - 500 kg. In 1975 feedlots produced 600,000 head of cattle, 70 - 80 per cent of which were of imported origin. This important form of production is dealt with in greater detail below.

3. Production in feedlots

The development of feedlots has occurred over the last ten years. IRVAM(190) conducted a study of 302 such centres in 1969 and a resurvey in 1975. The feed lots are concentrated in Northern Italy, especially in the Venetian region. Since 1969 the average size of feedlot

has grown considerably, so that in 1975 almost 50 per cent production was concentrated in 36 lots of over 1500 cattle each. Average weight of the animals at purchase is 158.9 kgs, and average weight at time of sale 483 kgs, the average fattening period being 297 days. It should be noted that the larger enterprises purchase the animals when they are lighter, i.e. at 133.05 kg. Tables 46 and 47 give an indication of feed consumption in feedlots of varying size. The largest enterprises, of over 5,000 head, feed considerably less (12.8 kg per head per day) than smaller enterprises (e.g. for enterprises containing 501 - 700 animals 14.18 kg are fed per head per day). Overall, the breakdown for feed used is as follows :

	per cent
Cereals and compound feeds	40.9
Silage and fresh forage	51.7
Industrial by-products	3.1
Other feedstuffs	4.3
Total	100.0

Table 46 : Feed use in feed lots (kg. of feed per head per day), Italy

	Size of enterprise (no. of head)						
Feedstuffs	201-300	301-500	501-750	751-1000	1001-2000	2001-5000	over 5000
Cereals and concentrates	5.534	5.543	5.913	5.817	5.535	6.912	5.683
Silage and fresh forage	6.225	7.754	7.246	8.315	7.706	6.239	6.733
Industrial by-products	0.651	0.330	0.340	0.294	0.458	0.186	0.179
Other feedstuffs	0.612	0.733	0.681	0.264	0.571	0.973	0.205
Total	13.022	14.360	14.180	14.690	14.270	14.310	12.800

Source: ibid (I 90)

A study of the nine feed lots in the Veneto region (Bonsembiante et al. 1975) identified the following feed compositions (per cent) on two farms:

	Farm 1		Farm 2	
Up to weaning:	cereals	55	cereals	58
	soya meal	25	soya & sunflower meal	18
	bran	12	bran	5
	oilcake	3	oilcake	3
	minerals & vitamins	5	dried beet pulp	6
			minerals & vitamins protein complement	10
For growth:	cereals	60	cereals	60
	sunflower meal	20	soya meal	15
	dried beet pulp	15	dried beet pulp	10
	minerals & vitamins	4.5	bran	8
	urea	0.5	minerals & vitamins protein complement	7
For fattening:				
	cereals	70	cereals	73
	sunflower meal	10	soya and colza meal	11
	dried beet pulp	15	dried beet pulp	6
	urea	1	bran	11
	minerals & vitamins	4	minerals, vitamins, protein complment	5

In another study of feedlots, also in the Veneto region, published in 1975, Bonsembiante et al. have shown that between 1969 and 1971 feeding

techniques changed considerably, with a reduction in hay consumption, a doubling of maize silage intake and a slight reduction in the amount of concentrates fed. In recent years dough stage maize silage fed in a ration with maize grain silage has become increasingly important as a source of feed. In this way all the maize forage produces high yields in dry matter combined with a high energy content; all phases of production and use are easily mechanisable; and the use of high moisture silage avoids the expense of grain drying. In some feedlots where the number of cattle fattened is high in relation to the surface area available to the farm, the arable land is used principally for maize silage production, while grain may be bought in. In these units maize silage will tend to be the main component of the ration and grain maize, barley, or dried beet pulp mixed with the silage or fed alone will be given as an energy supplement. In the South large feedlots can only be maintained if there is sufficient irrigated land to permit the production of maize silage, or if concentrates can be obtained at sufficiently low prices.

Table 47 : Productivity in feedlots by size of enterprise, Italy

Item	Size of enterprise (no. of animals)						
	201-300	301-501	501-750	751-1000	1001-2000	2001-5000	over 5000
Average daily liveweight gain (kg)	1.035	1.117	1.108	1.145	1.130	1.112	1.046
Feed (kg per day)	13.02	14.36	14.18	14.69	14.27	14.31	12.80
Feed conversion (Feed required for 1 kg live-weight gain)	12.58	12.85	12.80	12.83	12.63	12.87	12.24

Source: ibid.

4. Bulls and oxen

With increasing mechanisation production has gone down considerably in the last ten years. The animals are kept between 24 and 30 months, being stabled in winter and fed pasture and fresh forage in the summer. This type of production, using traditional local beef breeds, can be found largely in Tuscany and Piedmont. Approximately 500,000 cattle of this type were still being produced in 1975.

5. Culled cows

As a by-product from milk production, 690,000 head were slaughtered in 1975.

6. Veal production

In 1975, 700,000 veal calves were raised, of which 380,000 by traditional methods, and the rest in specialised production units. The traditional method uses domestically produced calves and is effectively a by-product of milk production. The specialised production units, which are more intensive, use two-thirds imported calves (200,000 in 1975).

IRVAM (190) examined intensive veal production in 169 enterprises with more than 400 animals each. The calves used for veal production were generally from milk breeds well adapted to achieve a weight of 190 - 220 kg in a relatively short period (four to five months). For all enterprises together, the average weight at the time of purchase was 52.37 kg and liveweight at the time of sale 197.57 kg, the average fattening period being 144.75 days. The basic feed used was milk powder, generally fed in increasing quantities up to 100 kg, at which point the daily amount fed is stabilised. During finishing, a small amount of dough stage maize silage may be fed. Table 48 summarises the results obtained for various sizes of enterprise.

Table 48 : Veal production; average daily weight gain, quantity of feed used per animal per day in different sizes of enterprise, Italy.

Size of enterprise (no. of animals capacity per cycle)	Feed per day in kg.	Average daily weight gain (per day) kg
101 - 200	1.927	1.018
201 - 300	1.854	1.014
301 - 400	1.812	0.954
401 - 500	1.869	1.021
501 - 750	1.870	1.001
751 - 1000	1.792	0.960
1001 - 1500	1.748	0.994
over 1500	1.793	1.037

Source: ibid

BEEF AND DAIRY

NETHERLANDS

1. Background

In 1976 production of beef and veal in the Netherlands reached 376, 300 tons, having risen almost continuously since 1970. Beef production tends to be dispersed among the dairy farms and 85 per cent of the beef produced originates from the dairy herd, especially from culled dairy cattle (NL 101). Specialised beef production from the fattening of young bulls is concentrated in specific areas and large beef production units are rare. It should, however, be noted that the number of young bulls for fattening has recently increased considerably (from 104, 175 slaughtered in 1970 to 185,610 in 1976) (NL 101). More profitable veal production for export sets a limit to this expansion since 80 - 85 per cent of bull calves born are used for veal.

Consumption of beef and veal has risen steadily since the early 1970's reaching 21.6 kg per head of population in 1976.

2. Feed use

Given that beef production is largely a by-product from the dairy herd, feeding methods will always vary considerably, dairy cows being fed whatever happens to be available on the average dairy farm. During pasturing dairy cows and other cattle will be fed grass, hay and possibly silage, according to season, and those arable crops which are produced on the farm, sugar-beet (leaf and tops),

maize - silage, and sometimes potatoes. This roughage will be supplemented with compound feed to increase the weight of the cow. The amounts fed in this way have increased considerably since 1970, reaching 4.0 kg of concentrates per animal per day in 1977. (See Table 49 below).

Table 49 : Compound feed use per milk producing cow, fattening steer, fattening bull during pasturing, (1 May - 31 October) Netherlands, 1970 - 1977

Year	Compound feed use per animal per day (kg)	Total compound feed use per animal during pasturing (kg)
1970	1.7	307
1971	1.9	353
1972	2.6	476
1973	2.8	519
1974	3.0	554
1975	3.4	613
1976	4.8	875
1977	4.0	734

Source: Bedrijfsontwickeling, 1978 (NL 108).

Partly as a consequence of this rise, overall consumption of compound feeds for cattle has more than doubled since 1970/71, reaching 4,212,000 tons in 1976/77. (See Table 50 below)

Table 50 : Consumption of compound feeds, all cattle, Netherlands, 1970/71 - 1976/77[a]

Year	Quantity '000 tons
1970/71	2066
1971/72	2374
1972/73	2955
1973/74	3131
1974/75	3334
1975/76	3714
1976/77	4212

Note : a July to June.

Source : Produktschap voor Veevoeder. (NL 107).

Table 51 gives the breakdown, for one year only, of raw materials utilised in compound feeds, together with an estimate of consumption of all other types of cattle feed.

Table 51 : Feed use by all cattle,[a] Netherlands, 1975/76

Type of Feed	'000 tons
a) Compound feeds, containing :	
Wheat	1
Oats	15
Corn	107
Sorghum	3
Total grains	126
Pulses	147
Vegetable fats & oils	9
Lucerne meal	6
Grass meal	43
Tapioca	279
Oilseeds	56
Milling products	183
Pressed brewer's grain	17
Pressed fibrous plants	13
Potato protein	1
Maize gluten feed	707
Pressed beet pulp	950
Molasses	173
Vinasse	67
Pellets, cakes	640
Pressed citrus pulp	429
Animal fats	3
Whey	1
Urea	1
Minerals	84
Trace elements	5
Vitamins/antibiotics	1
Total	3941
b) Milk and arable and forage crops :	
Whole milk	145
Skim milk	22
Whey	126
Potatoes	279
Wet fibres	424
Hog-wash	58
Wet potato fibres	280
Wet beet pulp	71
Potatoes	51
Fodder beets	205
Stubble	1030
Maize silage	3130
Hay	2369
Grass silage	4527
Pasture (dry matter)	5570
Beet leaf and top	1051
Straw and wastes	270
Total	19572
Total a) & b)	23513

Note: a Includes small amount of feed used for horses and sheep.

Source : ibid.

It is significant to note that the use of by-products such as maize gluten feed, citrus pulp etc. has increased considerably since the early 1970's.

The expansion of the number of young bulls fattened can be largely correlated with a substantial increase in the area planted to maize, from 6400 hectares in 1970 to 109,500 hectares in 1977(NL 108). After a period of feeding with milk substitutes, maize silage is being increasingly used as the principal source of roughage in this type of specialised beef production, as can be seen from the very large increase in maize silage production (See Table 52).

Table 52 : Maize silage production, Netherlands, 1970 - 1977

Year	Production '000 tons
1970	253
1971	522
1972	1262
1973	2104
1974	3065
1975	3121
1976	2402
1977	4701

Source : Bedrijfsontwickeling, 1978 (NL 108).

Young bulls are generally raised to about 500 kg liveweight at 16 months. Up to slaughter roughly 2000 kg starch units will be fed, half consisting of roughage and half consisting of concentrates.

3. Feed conversion, beef cattle

Over the last ten years feed conversion and average daily gain for beef cattle have improved by 10 per cent. This is a consequence of better breeding and feeding and the switch from steers to bulls. At present the average daily liveweight gain up to a final carcass weight of around 310 kg is 1000 grams. The feed required for 1 kg liveweight gain is 4000 starch equivalents or 5800 VEVI (beef feed units)[a] (NL 112).

Note : a One beef feed unit is equivalent to 0.951 VEM i.e. the feed value of one kg of barley for a dairy cow.

4. Feed conversion, dairy cattle

In 1965 the average milk yield in the Netherlands was 4171 kg in a 305 days' lactation, or 13.7 kg of milk a day with a fat content of 3.82 per cent. By 1976 the average yield had increased to 4725 kg of milk in a 305 days' lactation, or 15.5 kg of milk a day with a fat content of 3.96 per cent. This has involved a considerable rise in concentrate consumption per cow (See Table 49), but has also been brought about by improved breeding, especially the wider use of Friesian Holstein bulls. Higher compound feed consumption has led to increased stocking rates. Cow numbers rose from 1.9 to 2.2 million between 1970 and 1977. Concentrate intake will naturally vary according to the season. In the summer when cows are out at pasture production of up to 20 kg of milk can be maintained without concentrates. For every two kg of milk above 20 kg, one kg of concentrates is required. In winter forage crops

can provide maintenance plus between 8 and 10 kg of milk with again 1 kg of concentrates being fed for every additional two kg of milk. (NL 110) Total concentrate use per cow will depend on the time of calving: up to 2100 kg for autumn calving, and rather less for the spring.

Average conversion rates of feed into milk cannot be easily estimated. In practice there is much waste from overfeeding of concentrates and the feed value of pasture is seldom known. Where cows are housed the average feed requirement has been estimated at 11400 VEM[a] for 15.6 kg of milk with a fat content of 3.96 per cent. (NL 112)

Note: a VEM = 'voedereenheid melk'; milk feed unit = the fodder value of 1 kg of barley with dairy cows.

Table 53 : Compound feed consumption, per dairy cow,[a] Netherlands, 1970/71 - 1976/77

Year	Quantity kg
1970/71	1260
1971/72	1370
1972/73	1585
1973/74	1595
1974/75	1640
1975/76	1865
1976/77	2095

Note : a Includes feed for replacements. Figures being for larger dairy farms.

Source : Landbouw - economisch Instituut (NL 115).

UNITED KINGDOM

1. Background

The total cow population fell by 9 per cent between 1973 and 1977, but the proportion of cows of beef breed remained unchanged at one third. Average milk yields per cow of the smaller 1977 dairy herd were, however, 11 per cent above the 1973 level. Beef output was stimulated in anticipation of the much higher EEC common price which, unlike that for milk, was adopted on accession in one step and not by stages over the five-year transition period. Owing to application of MCAs, however, support prices for both commodities in terms of sterling have remained well below their full potential. A fully devalued "green" pound would have provided a still greater stimulus to output. Even so, the beef market became over-supplied between 1974 and 1976. As a result, production had by 1977 fallen back to 113 per cent of its 1972 (pre-accession level), having peaked at 132 per cent in 1975. The corresponding peak in Ireland in the same year was 177 per cent of 1972, which, in a mainly exporting country, resulted in support buying by the intervention agency on a much greater scale than was ever necessary in the United Kingdom.

With an even lower long-run rate of self-sufficiency in dairy products than in beef, the United Kingdom market has absorbed without much difficulty the 7.1 per cent increase in milk output achieved since 1972. Almost 60 per cent of output continues to supply the total requirements of the liquid market, the balance being absorbed by local demand for manufacturing milk, aided when necessary by the Community's various support arrangements. Neither the overvalued green pound, nor the recently introduced Community "co-responsibility" levy on producers, have so far constituted strong

disincentives to increasing output. Nor, so long as there are still green pound devaluations to be conceded, will any freeze of the common target price have much effect.

Exports of live calves to the European continent have been stepped up since 1976, but, against a total beef output of around one million tons, veal production, about 9000 tons a year, remains a negligible factor.

2. Feed use

Aggregate statistics for total feed use for all types of livestock are presented in Tables 54 to 61 . Reference back to them will be made as necessary in the pigmeat and poultrymeat sections. The basic data on feed use for the United Kingdom are derived mainly from the Ministry of Agriculture, Fisheries and Food. When published, however, they are sometimes quoted on a calendar year basis in some publications, and on a crop year basis in others. This leads to certain obvious difficulties in attempting to integrate series, or to reconcile apparent discrepancies.

Table 54 : Use of cereals by livestock, United Kingdom, 1969/70-1975/76[a]

Crop Year	Wheat	Barley	Oats	Mixed grain	Other[b]	All cereals
		'000 tons			'000 tons	
1969/70	2773	7573	1037	217	1960	13560
1970/71	4093	6485	1021	254	1566	13419
1971/72	3130	7433	1099	204	1743	13609
1972/73	3621	7055	1049	214	2053	13992
1973/74	2614	7285	866	190	2046	13001
1974/75	3456	6560	737	145	1806	12704
1975/76	2841	5295	637	117	2895	11785

Notes: a August - July crop years
b Includes imported maize

Source: HMSO (UK 117) pp 8-11.

Table 55 : Use by livestock of maize, oilcake and milling offals, United Kingdom, 1969-77[a]

Type of feed	1969	1970	1971	1972	1973	1974	1975	1976	1977
					'000 tons				
Maize	2003	1762	1532	1688	1828	1587	1632	2181	2508
Oilcake and Meal	1332	1407	1245	1375	1543	1417	1405	1798	1776
Wheat milling offals	1550	1431	1358	1349	1370	1332	1342	1338	1272

Note: a Calendar years.

Source: HMSO (UK117) p.259

Table 56 : Production of compound feedingstuffs, United Kingdom, 1969-77

Type of feed	1969	1970	1971	1972	1973	1974	1975	1976	1977
					'000 tons				
Cattle	3555	3689	3457	3812	3926	3637	4107	4740	4452
Calf	406	400	386	433	449	385	360	410	396
Pig	2424	2589	2651	2533	2793	2607	2179	2463	2316
Poultry	4055	4109	3911	3869	3820	3498	3346	3495	3353
Other	242	227	192	202	233	226	224	269	276
Total	10682	11014	10597	10849	11221	10353	10216	11357	10793

Source: HMSO (UK 117) p.258

The production of compound feedingstuffs in total reflects changes in the livestock population, particularly cattle and poultry. The cattle population reached a peak in 1974, while for pigs relative peaks occurred in 1971 and 1973. Poultry numbers peaked in 1970 and 1973. The increases in feedingstuffs production for cattle, calves, and "other", from 1975 may be explained partly in terms of numbers, but probably also in terms of decreased availability of alternative feedstuffs because of

the droughts of 1975 and 1976. Table 57 provides a somewhat more detailed breakdown of cattle and calf feed production from a different source. The disparity between the totals remains unexplained.

Table 57: Production of compound and other processed animal feedingstuffs, United Kingdom, 1973-77.

Type of feed	1973	1974	1975	1976	1977
			'000 tons		
Cattle and calf	4375	4022	4469	5146	4843
Calf	449	385	361	409	396
Balancers[a]	67	45	5[b]	5	5
Concentrates[c]	178	154	210[d]	202[d]	150[d]
All other feeds[e]	3681	3439	3893	4530	4293
Pig[f]	2793	2608	2182	2463	2322
Poultry[g]	3820	3498	3349	3475	3375
Sheep and lamb[d]	84	80	66	81	88
Other compounds and concentrates	149	145	157	188	188
Grain mixtures[d]	422	352	382	394	364
Total	10359	10706	10544	11750	11180

Notes:
a Balancers denote a composite of protein, minerals and vitamins, usually as a supplement to barley.
b Northern Ireland only after 1974.
c Concentrates denote commercially mixed cereal/balancer compounds usually processed into pellets or similar form.
d Great Britain only.
e Includes a wide variety of different feeds: milk production, beef finishing, grass supplement, etc.
f For detail see Table 93.
g For detail see Table 126.

Source: Turret (UK 119) pp 25-26, Tables 40 and 42.

Table 58: Raw materials used in compound animal feedingstuffs, Great Britain[a], 1975-77

Material	1975	1976	1977
		'000 tons	
Wheat	1226	2083	1838
Barley	1841	1906	1900
Maize	2383	1446	1552
Oats	96	98	99
Sorghums	260	183	89
Wheat by-products	1035	972	951
Oilseed cake and meal:	1028	1163	1112
High and medium protein	935	1010	954
Low protein	93	153	158
Animal substances and protein concentrates	637	524	514
Oil and fat	83	84	88
Molasses	411	453	418
Other materials (including grains)	1592	698	1567
Total	10592	10641	10128

Note: a United Kingdom less Northern Ireland

Source: Turret (UK 119) pp. 37-38

Table 59 indicates typical ways in which raw materials were incorporated in standard and summer grazing dairy rations over a four year period.

Table 59 : Composition of livestock rations, Great Britain, six-monthly periods, January 1975-Dec. 1978.

Ration	Period	Wheat	Barley	Other[a]	Total Cereals	Cereal by-products	Animal and vegetable protein	Other	Total
		per cent							
Standard dairy	Jan-June '75	13	24	4	41	28	12	19	100
	July-Dec '75	15	23	6	44	25	14	16	100
	Jan-June '76	13	24	8	45	24	14	17	100
	July-Dec '76	21	13	6	40	31	13	16	100
	Jan-June '77	17	21	6	44	27	15	14	100
	July-Dec '77	16	24	2	42	25	16	17	100
	Jan-June '78	14	18	-	32	36	15	17	100
	July-Dec '78	10	18	-	28	30	18	24	100
Summer grazing	Jan-June '75	8	14	4	26	49	6	19	100
	July-Dec '75	3	26	3	32	44	5	19	100
	Jan-June '76	4	25	3	32	37	8	17	100
	July-Dec '76	13	15	7	35	38	10	17	100
	Jan-June '77	6	25	5	36	36	10	18	100
	July-Dec '77	6	23	1	30	41	8	21	100
	Jan-June '78	3	9	-	12	51	13	24	100
	July-Dec '78	5	14	-	19	39	13	29	100

Note: a includes maize

Source: Turret (UK119) p.37, Table 58.

UKASTA/MAFF (UK 120) for July 1977 to Dec. 1978.

The relative increase in the use of cereal by-products during the 1975-78 period is due to price changes within the cereals market which tended to favour by-products. It is not clear to what extent these changes may have been due to the accession arrangements for U.K. membership of the Community. Between 1975 and 1978 the price differential between manioc and cereals favoured the farmer. This trend has, apparently, now been reversed with upward pressure on manioc prices making it a less attractive feed ingredient.

There is a notable amount of fluctuation between successive six-month periods in the proportions of the various ingredients in these diets. This must mainly reflect price variations. If put together on a least-cost basis, there is considerable scope for switching ingredients of compounds. The sharp decline in grain use, in favour of other cereals, during the first half of 1978 is particularly marked.

Tables 60 and 61 indicate output and use of fodder crops.

Table 60 : Production of fodder crops for livestock, United Kingdom, 1969/70 - 1977/78

Crop year	Beans	Turnips, swedes and fodder beet	Mangolds	Maize, green or silage	Rape	Kale Cabbage, savoy, kohl rabbi
			'000 tons			
1969/70	236	5549	621	-	760	3168
1970/71	159	5651	580	-	642	2810
1971/72	134	5306	576	88	665	2715
1972/73	166	4978	478	151	479	2420
1973/74	187	5631	507	330	568	2747
1974/75	200	6217	477	606	504	2750
1975/76	95	6035	411	884	618	2607
1976/77	70	4816	360	836	601	1633
1977/78[a]	112	5869	457	1196	578	2450

Note: a From second source cited.

Source: HMSO (UK 117) p.251
HMSO (UK 118) p.33

Table 61 : Use of fodder crops, United Kingdom, 1969/70 - 1975/76

Crop year	Potatoes[a]	Sugar beet[b]		Hay[c]	Silage[d]
		Pulp	Tops		
	'000 tons				
1969/70	203	610	1508	8736	8294
1970/71	881	699	1603	7833	9359
1971/72	823	792	1967	8978	11130
1972/73	235	750	1554	9573	13370
1973/74	395	779	1857	9391	16464
1974/75	428	529	1147	8072	17465
1975/76	136	531	1216	6595	17587

Notes:
a August-May crop year
b October-September crop year.
c June-May crop year.
d Calendar year, i.e. 1969/70 is 1969.

Source: HMSO (UK118) pp 12-14.

Total output of hay while varying from year to year, according to weather conditions, has remained markedly steady. Both the uncertainty of the summer weather and the rising cost of cereals have, however, led farmers increasingly to turn to silage as a basis for their maintenance, and for part of their production, rations for milk and beef outside the grazing season.

The use of potatoes reflects the marketing policy of the Potato Marketing Board in administering the national guaranteed price. There is still no common market regulation for potatoes. In years of high supply, and hence lower market prices, the Board will buy potatoes to prevent them reaching the retail market, and re-sell them to farmers as stock feed. Variations in sugar beet use reflect to a large extent weather-induced production fluctuations. In 1975/76 summer drought seriously affected hay and potato yields.

The most dramatic change in the production of fodder crops relates to maize, although, until hardier varieties become available, this crop will be restricted to the South of England. Except for turnips etc., the trend for most of the other fodder crops is downwards. This also reflects the increasing use of maize and grass silage in cattle rations, particularly in the dairy herd.

3. Feed conversion

(a) Dairying - England and Wales

The following tables set out the use of concentrates by different breeds of dairy cows at three levels of performance, and by dairy replacements.

Table 62 : Milk yield and concentrate use, per dairy cow[a]

	Milk yield (litre)	Concentrates (tons)	Forage area (hectare)
Friesians:			
low	3750	1.44	0.59
average	4500	1.44	0.57
high	5250	1.44	0.57
Channel island breeds:			
low	2800	1.15	0.50
average	3300	1.15	0.50
high	3800	1.15	0.50
Other breeds:			
low	3400	1.30	0.55
average	3900	1.30	0.55
high	4400	1.30	0.55

Note: a The figures in the table relate to a year's production.

Source: Nix (UK 123) pp 21-30

Table 63: Concentrate use: dairy replacements[a] (per heifer)

	Concentrates (tons)	Forage area (hectares)
Friesian	0.85	0.85
Channel Island	0.70	0.72
Ayrshires	0.80	0.76

Note: a These data relate to average performance

Source: Nix (UK123) pp. 31-33.

- Scotland

Table 64 : Milk yield and concentrate use: dairy cows[a]

	Milk yield (litres)	Barley (tons)	Concentrates[b] (tons)	Hay (tons)	Silage[c] (tons)	Forage area (hectares)
low[d]	4100	0.51	0.76	0.96	3.25	0.52
high[d]	5450	0.51	1.22	0.81	3.25	1.45

Notes: a Data refer to an autumn-calving cow fed on a hay, silage and concentrates regime. The concentrate usage and barley usage by spring calving cows respectively, under the same feeding programme are low: 0.46 and 0.46; high: 0.71 and 0.81
The forage areas are identical.

b Supplement fed in pelleted form during milking.

c silage at 18-20% dry matter

d low refers to the 900 gallon cow and high to the 1200 gallon cow.

Source: The Scottish Agricultural Colleges (UK 125) pp 62 and 64.

There are a variety of combinations of calving dates and times of the year when the heifer was born. Of the four given in the source document, only autumn born- autumn calving figures are given in the following table.

Table 65 : Concentrate use: dairy replacements [a, b]

Ration type	Concentrates (tons)	Hay (tons)	Silage (tons)	Roots (tons)	Forage area (hectares)
Mainly silage	0.91	0.51	4.42	-	0.68
Hay and roots	0.91	0.91	-	4.42	0.64

Notes: a The data are on a per heifer basis over the pre-calving existence of the animal, which is assumed to be 26 months old at first calving.

b For spring born, autumn calving heifers, the age is taken to 30 months and the forage area is increased slightly to 0.71 hectares, with concentrate usage of 0.66 ton.

Source: The Scottish Agricultural Colleges (UK 125) p.55.

(b) Beef

Although there are the two basic sources of beef, the dairy herd and the beef herd, many systems of beef production are practised. Of these a number have been selected which, it is believed, are reasonably representative.

(i) Beef from the dairy herd: England and Wales

Table 66 : Feed use of various dairy beef systems: England and Wales

System	Barley (tons)	Concentrates[a] (tons)	Milk substitute kg	Hay (tons)	Feed conversion
Barley beef[c]	1.7		13		6.1[d]
18 month beef:S[b]		0.8	13	0.2	
18 month beef:A[b]		1.25	13	0.2	

Notes: a Barley and concentrates are shown separately because the barley refers to the post-6-month stage, the concentrates being fed as calf rations up to 6 months

b S: spring-born calf at 405 kg at slaughter
A: autumn-born calf at 430 kg at slaughter

c Weight gain from 3 months to slaughter is 113 kg to 390 kg

d From weaning (107 kg) to slaughter (390 kg)

Source: Nix (UK123) pp 38 and 40.

(ii) Beef from the dairy herd: Scotland

The information available relates to calf rearing from birth to three months and then there are three main alternative systems: cereal (i.e. barley) beef, 18-month fattening of autumn-born calves, and 24-month fattening of spring born calves. The data are as follows:

Table 67 : Feed use of various dairy beef systems: Scotland

System	Barley (tons)	Concentrates (tons)	Milk substitute(kg)	Silage (tons)	Hay (tons)	Grazing (ha)
Calf rearing[b]		0.114	16		0.055	
Cereal beef[c]	1.475	0.180			0.100	
18-month[d]	0 570	0.300		5.8	0.025	0.12
24-month[e]	0.490	0.340		8.42	0.188	0.14

Notes:
a For the distinction between barley and concentrates see Note a of Table 66 .
b From birth to 12 weeks
c Feed conversion of 5.6: 1, from 100 kg to slaughter (395 kg), represents a top one-third performance
d Autumn born
e Spring born

Source: The Scottish Agricultural Colleges (UK 125).

(iii) Beef from the beef herd: England and Wales

The most common systems of beef production from the beef herd involve the single suckler cow that rears a calf which is born in the late winter/spring period or the autumn/early winter period. These calves are then sold on weaning for fattening on as yearling stores depending upon the time of year at which they were born. Several combinations of store and fattening systems are outlined by Nix (UK123). Two of these are given below.

Table 68 : Feed use in various beef systems: England and Wales[a]

System	Feed	Late winter/early spring calving	Autumn/early winter calving	Upland
Single suckler[b]	concentrates[c] (ton)	0.22	0.33	0.17
	forage area (hectares)	0.60	0.65	0.80
Summer fattening at 18 months[d]	concentrates	0.22		0.22
	forage area	0.40		0.40
Winter fattening at 18 months[e]	concentrates		0.45	
	forage area		0.15	

Note:
a Data are on a per head basis
b It is assumed that spring-born calves are fed as stores through their first winter and fattened on grass during their second summer. The autumn-born calves are fattened during their second winter indoors.
c Concentrates consisting of cereals (mainly barley) and balancer supplement either pelleted commercially or mixed on farm.
d Slaughter weight of 380 kg
e " " of 400 kg

Source: Nix (UK 123) pp 35 and 39.

(iv) Beef from the beef herd: Scotland

In Scotland the breeding herd is classified according to whether the farms are regarded as hill or as upland. A small proportion only of the beef breeding herd is situated on lowground farms, and is relatively unimportant. In what follows, the intermediate upland category is referred to with calvings at four periods of the year.

Table 69 : Feed use in various beef systems : Scotland[a]

System	Feed	Calving period			
		Nov-Jan	Feb-April	May-July	Aug-Oct
Upland suckler cows:	silage (tons/cow)	6.5	6.0	8.5	8.0
	calf concentrates (kg)	62	-	284	178
	barley	380	203	132	218
	hay (kg)	38	-	-	-
	forage area (hect)	0.62	0.58	0.64	0.65
Winter fattening:	silage (ton)	4.4			
	barley (ton)	0.224			
	forage area (ha)	0.17			

Note: a The data on upland suckler cows relates to the cow and calf: that on winter fattening relates to the fattening period from 300 kg liveweight to 405 kg.

Source: The Scottish Agricultural Colleges (UK125)

(v) Fattening advanced store cattle from beef and dairy breeds

This enterprise amounts to the final fattening of advanced store cattle from dairy or beef backgrounds which weigh around 400 kg initially and which are sold at around 500 kg liveweight for slaughter. The following data relate to the winter and summer fattening periods only.

Table 70 : Feed use of advanced store cattle: England and Wales

Feed	Fattening Period	
	Summer	Winter
Concentrates (ton)	0.0	0.50
Forage area (ha)	0.30	0.15

Source: Nix (UK 123) p.37.

(c) Veal

The following data for feeds by veal calves are given in Nix (UK123) p.41. The consumption of concentrates from 45 kg to 170 kg liveweight is assumed to be 0.19 ton, with a feed conversion ratio of 1.5:1. This ratio refers to conversion in relation to cereals fed and excludes the

dry-weight equivalent of milk. Similar figures are given by the Meat and Livestock Commission (UK 121).

SHEEPMEAT

BELGIUM

Since the early 1970's, consumption of sheepmeat and goatmeat in Belgium has risen from 1.0 kg per head in 1972 to 1.7 kg per head in 1977.

Total production remains low at an average of 3,000 tons a year since 1971 (G 62).

No data are available for feed use or feed conversion.

DENMARK

Production and consumption of sheepmeat and goatmeat in Denmark are of little significance. Since 1971, average production has totalled 1000 tons and consumption 2000 tons per year. Per head consumption remains very low at an average of 0.4 kg per year since 1970.

Table 71 below indicates the consumption of feedstuffs by sheep in 1976/77.

Table 71 : Consumption of feedstuffs by sheep, Denmark, 1976/77

Type of material	Consumption million feed units[a]
Cereals	3
Bran, pulses, draff, etc.	1
Protein feeds	2
Root crops, including tops	2
Grass crops	11
Straw	2

Note : a One feed unit = fodder value of one kg of barley.

Source: Landøkonomisk Oversigt, 1978 (DK 11)

There are no enterprise studies available relating to feed conversion effieiency.

FRANCE

France is the second largest producer of sheepmeat and goatmeat in the Community. Its share of Community production rose to 30 per cent in 1977 with a total production of 145,000 tons. Since 1970 consumption per head has risen slightly to reach 3.7 kg in 1977. Approximately 25 per cent of total consumption is derived from imports. (G 62).

Sheep are fed largely on pasture and a maximum of 60,000 tons of manufactured feed are produced annually. The composition (per cent) of the feed used for fattening is (F 40):

60 mainly maize plus some barley, wheat and oats.

31 soya cakes/groundnuts/dehydrated lucerne and other protein feeds.

7-9 alfalfa meal.

No data are available for feed conversion.

GERMAN FEDERAL REPUBLIC

(West Germany)

Sheep do not play a significant role in the agricultural production of West Germany. In 1978 there was a stock of 1.1 million animals and total lamb and mutton production was 19,000 tons. Consumption per head of population is only 0.7 kg and it has remained stable over the last four years (G 62). Sheep are raised entirely on pasture and no concentrates are consumed.

Due to the very small scale of sheepmeat production in West Germany, no information is available on either feed use or feed conversion.

IRELAND

Per head consumption of sheepmeat and goatmeat is higher in Ireland than elsewhere in the Community. Since 1970 it has remained stable at 11 kg a year. Production has declined since the early 1970's to 37,000 tons in 1977. Over the last two years an agreement with France has enabled producers to export sheepmeat to France at any time of the year. However, the relatively poor quality of lamb has not been able to satisfy French demand. The volume of exports has, therefore, not been very great, being only 3,000 tons in 1977.

No evidence relating to feed use or feed conversion is available, but it must be assumed that sheep are fed mainly on pasture.

ITALY

Production of sheepmeat and goatmeat in Italy is of little importance. Total production in 1977 was 36,000 tons, consumption being 61,000 tons. Consumption per head has remained almost unchanged at 1.1 kg for the last ten years. (G 62).

No data are available for feed use or feed conversion, but it may be assumed that feeding takes place almost entirely on pasture.

NETHERLANDS

The Netherlands have the lowest level of consumption of sheepmeat in the Community, per head consumption since 1970 being on average 0.2 kg per year. Out of a total production of 17,000 tons in 1977, 14,000 tons were exported and 3,000 tons were consumed domestically. (G 62).

No data are available on feed use or feed conversion. However, feeding takes place principally on pasture.

UNITED KINGDOM

1. Background

The United Kingdom is the principal producing member country of sheepmeat and goatmeat. Since 1973 its output has constituted each year a slightly declining percentage of total Community production (50 per cent in 1973; 44 per cent in 1977). France's share, the next largest, increased from 27 per cent to 30 per cent during the same period. Although there is at present no common market regulation for sheepmeat, removal by France of its variable levy on imports from other member countries may be ordered by the European Court of Justice, on the grounds that it is a restraint on intra-Community Trade contrary to the Treaty of Rome. If the levy is removed, unrestricted access to the higher-priced French market is likely to prove a stimulus to British producers, at least in the medium term.

2. Feed Use

Concentrate use has remained fairly steady in recent years. The relative decline in 1975 probably reflects on exceptionally open winter and long grazing season.

Table 72 : Production of compound and other processed feedingstuffs for sheep, United Kingdom, 1973 - 1977

1973	1974	1975	1976	1977
		'000 tons		
84	80	66	81	88

Source : Turrett (UK 119) pp 25, 26 Tables 40 and 42.

3. Feed conversion

The number of variations in breeding and fattening systems for sheep are considerably less than those for cattle. The following four sheep enterprises for England and Wales are given by Nix (UK 123).

Table 73 : Feed use by sheep: England and Wales[a,d]

	Fat lamb production[a]	Early fat lamb production[b]	Winter fattening[c]	Hill Sheep[b]
Concentrates (ton)	5.0	7.5	0.54	1.0
Forage area (ha)	12.0	10.0	1.8	-

Notes:
a. Data relate to 100 head from birth to slaughter.
b. Data are per ewe.
c. Per lamb.
d. For fat lamb production the number lambs per ewe is 1.35; for early fat lambs 1.2; and for hill sheep 0.8.

Source: Nix (UK 123) pp 42 - 44.

The sheep systems in Scotland are slightly more varied than the above table indicates, and the following choices of typical systems are given.

Table 74 : Feed use by sheep: Scotland[a]

	Lowground breeding ewes[b]	Hill breeding ewes[c]	Winter fattening[d]	Autumn winter fattening[e]
Concentrates (ton)	635	0.127	1.5	
Hay (ha)	0.8	0.50	0.33	
Swedes (ha)	0.8		0.10	
Rape (ha)		0.17		2.5
Grazing (ha)	8.5			

Notes:
a. Per 100 head from birth to slaughter.
b. The assumed output from 100 ewes is 116 fat lambs and 40 store lambs.
c. These data relate to Blackface sheep in the Grampian and Southern upland areas of Scotland and the hoggs are away wintered. The output per 100 ewes is assumed to be : 5 fat lambs, 57 store lambs and 28 replacements.
d. These data relate to 100 cross-bred hoggs outwintered on stubbles, grass and roots.
e. These data relate to 100 hoggs sold fat off rape in mid-November.

Source: The Scottish Agricultural Colleges (UK 125).

PIGMEAT *

BELGIUM

1. Background

Production and consumption of pigmeat in Belgium have declined slightly since 1974 (See Table 75).

Table 75 : Production and consumption of pigmeat, Belgium, 1971-1977

	Production '000 tons	Consumption '000 tons
1971	587	347
1972	624	359
1973	661	387
1974	696	396
1975	642	369
1976	645	372
1977	658	375

Source: Zentrale Markt und Preisberichtstelle (G 62)

In 1977 consumption per head was 36.8 kg. A considerable proportion of pigmeat produced is exported (283,000 tons in 1977).

2. Feed use

Fattening pigs are generally fed ad libitum with a finishing ration which usually contains 10 per cent cereals, up to 40 per cent manioc, 10-15 per cent soya meal and the remainder consisting of various by-products, such as maize - gluten feed. Up to weaning the cereal content of the creep feed may be as high as 40 per cent. Feeds are always constructed on a least cost basis compatible with minimal

* For a definition of Pigmeat, see Glossary, page xix .

nutritional requirement, so that actual composition varies considerably. Every effort is made to reduce the amounts of high price cereals used in the ration. Some potatoes will be used for on-farm feeding in years in which these are in surplus. High moisture maize is being used on a limited scale to supplement pig rations. It has been estimated on experimental farms that one hectare of maize could provide feed for approximately forty fattening pigs for one year.(B3 / B4) However, the scarcity of land for this kind of production suggests there is little scope for its expansion.

After a sharp rise to 1974 with the decline of on-farm mixing, use of compound feeds has since stabilised at a slightly lower level, reflecting a certain decrease in pigmeat production. (See Table 76).

Table 76 : Compound feed production for pigs, Belgium, 1971-77

Type of Feed	1971	1972	1973	1974	1975	1976	1977
				'000 tons			
Sows	529	634	723	761	704	737	728
Other	1742	1891	2021	2071	1941	2044	1988
Total	2271	2525	2744	2832	2645	2781	2716

Source: Samengestestelde Veevoeders (B 2)

Almost no feed is now mixed on farm, inputs tending to be available at lower net cost to compounders.

3. Feed conversion

For pigs from 20 - 100 kg liveweight, average feed conversion is 3.5 kgs of feed per kg liveweight gain, but there is a variation between 4.0 kgs on the less efficient farms to somewhere between 2.5 kgs and 2.7 kgs at experimental stations. Pelleted feed gives a marginally

better feed conversion rate. The majority of producers are, however, obliged at present to use feed meals rather than pellets because of a shortage of pelleting capacity.

Average daily liveweight gain to weaning, is 250 grams. From 20 kg to slaughter, average daily gain is 550 g. (B 9).

PIGMEAT

DENMARK

1. Background

Between 1973 and 1976 pigmeat production was falling,but in 1977 production rose by 3.5 per cent and a further increase occurred in 1978. (DK 11)

Table 77 : Production of pigmeat, Denmark, selected years

Year	Production '000 tons
1965-1969 (average)	781
1974	791
1975	776
1976	759
1977	786
July 1977 - June 1978	807

Source: Landøkonomisk Oversigt, 1978 (DK 11)

In 1977 70 per cent of pigmeat production was exported. The proportion exported has declined as domestic consumption has risen. From 1964 per head consumption of pigmeat rose by 7 kg to reach 45.8 kg in 1977. (DK 11)

2. Feed use

Since 1970 production of compound feeds for pigs has risen considerably, reaching around 1.5 million tons in 1977/78.

Table 78 : Production of compound feeds, pigs, Denmark 1970/71-1977/78

Year	Production '000 tons
1970/71 - 1974/75 (average)	1160
1975/76	1143
1976/77	1285
1977/78	1507

Source: ibid.

Over the same period total consumption of feedstuffs has declined as a consequence of the stagnation in pig production. (See Table 77) Since 1970 the use of cereals in the ration has decreased as increasing quantities of cereal substitutes were imported. In 1976/77 cereals did however still constitute around 75 per cent of the rations used for pigs, while protein feeds accounted for 16 per cent and other feeds 9 per cent.

Table 79 : Feeds used for pigs, Denmark, 1976/77

Type of feed	Consumption million 'feed units'[a]	Per cent
Cereals	3251	76.5
Bran, pulses, draff etc.	83	2.0
Manioc, molasses etc	47	1.1
Milk and milk products	158	3.7
Protein feeds	692	16.3
Root crops, including tops	12	0.3
Grass crops	7	0.1
Total 1976/77	4250	100.0
Total 1975/76	4239	
Total 1972/73	4972	

a. 1 'feed unit' = fodder value of one kg. of barley

Source: ibid.

In a feed based on cereals, fattening pigs (20-100 kg liveweight) may be fed a ration containing 77 per cent barley, 18 per cent soya meal and 5 per cent other feeds. Alternatively if tapioca is used, the feed may consist of 30 per cent soya, 30 per cent tapioca meal, 26 per cent barley, 8 per cent dried sugar beet pulp and 6 per cent other feeds. (DK 10)

3. Feed conversion

Based on a survey of 71,949 pigs (DK 14) feed conversion in Denmark in 1978 was 3.27 feed units[a] per kg liveweight gain from 27 to 92 kg liveweight. On average the pigs were fed 1.90 feed units per day and achieved a daily liveweight gain of 582 grams.

Note: a 1 feed unit = fodder value of 1 kg of barley.

FRANCE

1. Background

Pigmeat consumption has been rising since the early 1970's but domestic production is only increasing slowly at present because French producers face strong competition from countries, such as the Netherlands, where monetary compensatory amounts have tended to favour exports to weaker currency countries, and proximity to ports allows a greater use of imported feeds. In April, 1979, however, MCA coefficients were altered on several types of pigmeat. This, quite apart from any movement in exchange rates, was expected to have the effect of cutting MCA's by 5-10 per cent. Per head consumption had reached 35 kg by 1978 and is expected to rise to 41 kg by 1985, involving an extra production requirement of 380,000 tons. (F 44).

Table 80: Pigmeat production and consumption, France, 1970-1977

	Production		Consumption
	'000 head	'000 tons	'000 tons
1970	14718	1185	1390
1971	16149	1289	1473
1972	16714	1342	1521
1973	16782	1351	1517
1974	16279	1373	1581
1975	17398	1396	1634
1976	17604	1430	1663
1977	18111	1466	1709

Source: S.N.I.A. (F 38)

2. Feed use

Total output of compound feed has increased parallel to the rise in pigmeat production. (See Table 81). Within this total, however, piglet feed is thought to have reached a ceiling, whereas there is still scope for some growth in the market for sow and fattening feeds.

Table 81 : Production of compound feeds for pigs, France, 1970-1977

Year	'000 tons
1970	2781
1971	3191
1972	3629
1973	4026
1974	4232
1975	4197
1976	4435
1977	4531

Source: S.N.I.A. (F 38)

Information from various sources (F 40, F 43, F 45), suggests that currently the main raw materials for compound feeds for pigs, depending on their purpose, are broadly within the following percentage ranges:

Cereals (mainly wheat, some maize and a little barley)	50-65
Manioc	15-20
Soya	12-20
Molasses	5-8
Bran	3-10

Since most feeds are constructed on a least cost basis compatible with minimal nutritional requirements, proportions will vary in accordance with market price fluctuations. In those areas where transport costs of imported feedstuffs are low, i.e. Brittany, and near ports, cereal usage will be considerably lower than in areas more remote from the sea.

Compared with raw materials utilised in France at the beginning of the current decade (see Table 82) there has been a notable increase in the use of manioc and molasses and some reduction in the total use of oilseed cake and meal (though not of soya).

Table 82 : Raw materials used for pig feed by the compound feed industry, France, 1970[a]

Type of material		'000 tons	per cent
Cereals:	Wheat	644.0	23.0
	Barley	700.0	25.0
	Maize	84.0	3.0
	Total:	1428.0	51.0
Meals:	Fish	28.0	1.0
	Meat	98.0	3.5
Feed-cakes:	Soya	504.0	18.0
	Groundnut	140.0	5.0
	Colza	84.0	3.0
	Total:	728.0	26.6
Bran middlings and by products		308.0	11.0
Sugar		36.-	1.3
Molasses		33.6	1.2
Manioc		14.0	0.5
Minerals		70.0	2.5
Skim milk		14.0	0.3
Whey		28.0	1.0
Total		2800.0	100.0

Source: Commission of the European Communities, (EC 131).

Note: a No more recent data available.

Production methods are quite diverse,but as a general rule weaning takes place at 21-28 days at 7-8 kg liveweight. Very little purchased creep and weaner feed is used up to this point. In the initial fattening period, up to 25-30 kg liveweight lasting a maximum of forty days, pigs will consume 35-40 kg of pelleted feed consisting of (per cent):

Cereals (mainly wheat)	60
Soya	20
Fish meal, skim milk, fine bran.	20

From around 28 kg to slaughter at 100-105 kg liveweight fattening pigs will consume a further 250 kg of feed containing a high proportion of wheat (up to 40 per cent), some maize, and/or barley, meat meal, soya, bean, manioc, molasses. (F 40, F 43). Breeding sows consume 1100-1200 kg of feed in a year consisting of (per cent):

Cereals	55-60
Soya	13-17
Cereal by-products	15-20
Lucerne meal	5
Other	3-12

The main cereals used are wheat, barley and maize, the proportions varying according to price fluctuations. (F 43).

3. Feed Conversion

A survey of 520,736 pigs carried out by the Institut Technique du Porc (F 33 / F 41) indicates an average feed conversion in France in 1978 (June 1977-July 1978) of 3.62 kg of feed per kg of liveweight gain. This involved feeding from an average of 28.1 k.g. to a final 102.7 kg liveweight. The standard error for feed conversion was 0.26.

Over the last five years average daily liveweight gain has improved

from 564 to 573 grams per day while feed conversion has remained constant. In the survey, which covers mainly the West and South-West of France, the following results were observed since 1974.

Table 83 : Feed conversion, pigs, France, 1974 - 1978

	1974	1975	1976	1977	1978[a]
Average starting weight of pigs (kg)	29.6 (2.7)[b]	29.1 (2.5)	28.4 (2.4)	28.7 (2.5)	28.1 (2.2)
Average liveweight at time of sale (kg)	104.1 (5.0)	102.2 (4.6)	103.0 (4.9)	102.7 (4.8)	102.7 (4.9)
Average of feed consumed per pig sold (kg)	270 (27)	267 (27)	272 (23)	266 (21)	272 (22)
Feed conversion (kg feed per liveweight gain of 1 kg)	3.63 (0.29)	3.64 (0.25)	3.64 (0.27)	3.58 (0.26)	3.64 (0.26)
Average daily liveweight gain (g)	564 (53)	559 (49)	566 (51)	563 (52)	573 (54)
Average length of fattening period(days)	132 (15)	130 (12)	131 (12)	128 (12)	129 (12)

a June 1977 - July 1978

b Figures in brackets refer to standard errors.

Source : Institut Technique du Porc. (F 33 / F 41)

In Brittany, Northwest France, which accounts for one third of total pigmeat production, pigs are fattened more quickly (110 - 115 days as opposed to 130 days in Table 83). The liveweight gain per day in Brittany is therefore higher, at approximately 600 g per pig per day, but the quality of the meat is inferior, inasmuch as it has a higher proportion of fat.

On an experimental basis feed conversions of 2.95 kg feed to 1 kg of liveweight gain and daily liveweight gains of 780 g per day have been achieved.

GERMAN FEDERAL REPUBLIC

(WEST GERMANY)

1. Background

Domestic production of pigmeat has risen since 1970, reaching 2,443,000 tons in 1976/77. (See Table 84).

Table 84 : Production of pigmeat, West Germany, selected periods

	Average 1970/71-1974/75	1975/76	1976/77
Total production('000)[a]	2253	2324	2443
of which: imports (tons)	358	414	383
exports	22	24	34
Consumption per head (kg)	41.9	44.3	45.5
Total consumption('000)[a] (tons)	2586	2732	2792
Percentage of consumption from domestic production(%)	87.1	85.1	87.5

Note: a Slaughter weight not including fats and offals.

Source: Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten, 1978. (G 59)

During the same period total consumption rose to 2,792,000 tons and consumption per head showed a corresponding rise from 41.9 kg (average 1970/71 - 1974/75) to 45.5 kg per year in 1976/77.

Imports of pigmeat have remained stable at about 380,000 tons per year, accounting for between 12 and 15 per cent of consumption. Production tends to be concentrated near the population centres of the North and Northwest, Lower Saxony and North Rhine Westphalia being the largest producing Länder (States).

2. Feed use

Since 1971 there has been a continuous rise in the use of compound feeds, consumption reaching 5,326,000 tons or 30 per cent of total feeds used in 1976/77 (See Tables 85/86).

Table 85 : Feed use for pigs, by type of feed, West Germany, 1971/72 to 1976/77

Type of Feed	1971/2	1972/3	1973/4	1974/5	1975/6	1976/7
	'000 tons (grain equivalent)[a]					
Grain	8801	8985	9684	9773	9929	10422
Potatoes	1182	1148	1056	1028	739	545
Other vegetables [b]	1156	1319	1141	1149	1081	1014
Concentrates [c]	2654	2446	2130	2616	2922	3377
Milk of all kinds	365	347	362	262	225	290
Total	14158	14245	14373	14828	14896	15648
In the form of compound feed	3243[d]	3417[d] 3847[e]	3682[d] 4141[e]	3458[d] 3898[e]	4059[d] 4608[e]	4690[d] 5326[e]

Notes:
- a See grain equivalent keg. Annex 1, page 184.
- b Sugar beet, leaf and tops potato and vegetable wastes.
- c Bran, pulses, manioc, oilseed cake, fish and meat-meal feed rice, lucerne meal, molasses and processing wastes.
- d '000 tons grain equivalent.
- e '000 tons feed.

Source: ibid

As the cost of labour rises, use of potatoes on small farms in Bavaria has declined and on-farm grain use has risen. This has helped to maintain use of grains at the relatively high level of

66.6 per cent of total feed used for pigs (See Table 86).

Table 86 : Feed use for pigs, percentage of each feed type used, (in grain equivalents), West Germany, 1971/72 to 1976/77

Type of feed	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77
			per cent			
Grain	62.1	63.1	67.4	65.9	66.6	66.6
Potatoes	8.3	8.0	7.4	6.9	4.9	3.4
Other vegetables [a]	8.2	9.3	8.0	7.8	7.3	6.5
Concentrates [b]	18.8	17.2	14.8	17.6	19.7	21.6
Milk of all kinds	2.6	2.4	2.4	1.8	1.5	1.9
Total	100.0	100.0	100.0	100.0	100.0	100.0
In the form of compound feed	22.9	24.1	25.6	23.3	27.3	30.0

Notes: a Sugar beet leaf and tops, potato and vegetable wastes.

b Bran, pulses, manioc, oilseed cake, fish and meat-meal feed rice, lucerne meal, molasses and processing wastes.

Source: Futterwirtschaft, 1978 (G 56)

Purchase of compound feed is more prevalent in Northern Germany, with its much higher concentration of pig population, than in Bavaria, where there is a surplus of own grain for feeding. The industry has estimated compound feed use per pig at 367 kg per year in Northwest Germany and 90 kg per year in Bavaria (G 50). The large scale of enterprises in the North and the lower transport costs of raw materials from North sea ports are major contributory factors.

While use of compound feeds is rising, there was a corresponding shift away from the more labour intensive feeds, such as potatoes. The proportion of cereals used in the ration has remained fairly constant, rising from 62.1 per cent in 1971/72 to 66.6 per cent in 1977/78 (See Table 85).

3. Feeding methods

The predominant method is at present trough feeding, whether undertaken manually or mechanically. Although mechanised feeders and pump feeding are on the increase, neither yet plays a major role. A 1976 survey of 1,009,516 pigs on holdings in all of Germany except Baden-Württemberg (G 48) indicated four main feeding methods, in descending order of usage: 75 per cent of pigs were fed in troughs (of which about 20 of the 75 per cent mechanically, or from feed hoppers, otherwise manually). 13 per cent were fed automatically (of which 15 per cent ad lib). 10 per cent were fed by means of a pump system. 2 per cent were fed out of doors on the ground (G 48). However, there is at present no significant evidence of the influence of feeding methods on aggregate production.

4. Feed conversion

There are several different estimates of feed conversion rates for pigmeat in Germany. Official figures are based on the notion of a grain equivalent (net energy value of products expressed in units of starch). The values estimated by the Ministry of Agriculture are not accepted by experts as wholly reliable (G69/G79). Estimates are based on aggregate figures for livestock and feed production and ignore wastage in the feeding process. This leads to some double counting, thus giving estimates which are too high.

Two other sets of figures for feed conversion are, however, available: derived from experimental breeding stations and from producer groups. In both cases these estimate feed conversion (kg of feed per kg liveweight gain) for pigs raised from 30 kg to 100 kg. Under 30 kg, liveweight feed conversion has remained practically constant (See Table 87).

Table 87 : Feed requirements for fat pig production, West Germany, selected periods

Item	Unit	Average 1965/66-1969/70	Average 1970/71-1975/76	1975/76
Feed requirement[a] for fattening a pig to 30 kg liveweight	kg (grain equivalent)[b]	119.7	119.7	119.7
	kg (units of starch)	87.4	87.4	87.4
	kg (units of protein)	14.8	14.8	14.8
Feed conversion for fattening pigs 30 - 100 kg liveweight (experimental stations)	kg/kg liveweight gain	3.07	2.90	2.79
Feed required for fattening pigs 30 - 100 kg liveweight (experimental stations)	kg (grain equivalent)[b]	210.6	198.4	191.4
	kg (units of starch)	146.4	138.2	133.0
	kg (units of protein)	27.8	26.3	25.3
Total feed requirements (experimental stations)	kg (grain equivalent)[b]	330.3	318.1	311.1
	kg (units of starch)	233.8	225.6	220.4
	kg (units of protein)	42.6	41.1	40.1
Feed conversion for fattening pigs 30 - 100 kg liveweight (producer groups)	kg/kg liveweight gain	3.75	3.64	3.56
Feed required for fattening pigs 30 - 100 kg liveweight (producer groups)	kg (grain equivalent)[b]	256.9	250.0	245.0
	kg (units of starch)	178.6	174.1	170.2
	kg (units of protein)	33.9	33.1	32.4
Total feed requirement (producer groups)	kg (grain equivalent)[b]	376.6	369.7	364.7
	kg (units of starch)	266.0	261.5	257.6
	kg (units of protein)	48.7	47.9	47.2

Notes : a Includes feed for sow and boar

b See grain equivalent Table. Annex 1, page 184.

Source : U. Hamm (G 69).

Note: The table is based on the values for feed composition, period of feeding, and average age at slaughter given below. Although not based on a statistical sample, the figures presented are held to represent the practice of the average producer in the year 1975/76,

(a) Feed required for the raising of a pig up to 20 kg liveweight (per cent) : barley 80, soya pellets 12.5, fish meal 5, minerals 2.5.

(b) Feed required for the fattening from 20 kg liveweight up to slaughter (feeding period : 140 days) - (per cent) : cereals 84, soya pellets 10, fish meal 4, minerals 2.

(c) Feed required per breeding sow per year (per cent) : cereals 88.5, soya pellets 7, fish meal 2.5, minerals 2.

(d) Feed required per boar per year (per cent) : cereals 91, soya pellets 7, minerals 2.

Feed conversion in experimental stations and producer groups has improved considerably over the last fifteen years. It is estimated that the results achieved by producer groups are 5 per cent better than the national average, which would imply a national average of 3.73 in 1975/76 (G 69). In recent years the difference in results has narrowed because of the growing competitive pressure on all farmers whether members of a group or not. The figures may therefore be assumed to be broadly representative of West Germany as a whole.

While there are still some regional variations in efficiency, they have tended to become less significant over the past ten years. The previously less efficient southern German producers

have considerably improved their performance.

In view of the fact that production technology has tended to stagnate in Northern and Central Germany, a study by Meents (G 55) of the interregional competitiveness of pig production has concluded that differences in technical achievement (e.g. feed conversion,daily liveweight gain etc.) were not of great significance. This conclusion is confirmed by Zeddies and Kleinhanss, (G 61) who argue that producers in Bavaria have a considerable competitive edge over producers in the rest of Germany because of the surplus of own grain, which the producers mix and feed themselves on their pig enterprises. The profitability for enterprises using home produced barley is in all cases greater than the returns to be achieved using purchased compound feed. This is the case even though prices for bought feed are, owing to the proximity of sea-ports, lower in the North than the South, and prices for home produced barley are greater in the North and lower in the South. The reasons for the differences in pig profitability are:(a) the lower cost of using own grain and (b) the higher prices producers receive for pigs in areas where the market is relatively close and the producers can use their own grain.

PIGMEAT

IRELAND

1. Background

Irish production has been predominantly for curing, with traditional export outlet for bacon and ham to the United Kingdom. Exports of pigmeat in 1976 and 1977 represented 28 per cent and 34 per cent, respectively,of total output.

2. Feed use

From Tables 41 and 43 on pages 54 and 57 two factors may be deduced. First, total production of compound feeds for pigs has roughly varied in proportion to livestock numbers, and thus cyclically. Although these were on an upward trend in 1975, the exceptionally low production of feed probably reflects some carryover of stocks from 1974. Second, while barley remains the staple ingredient of the pig ration, Table 43 indicates since 1975 a growing use of whey and a gradual return to earlier levels of use of separated milk.

3. Feed conversion

No enterprise studies have been carried out since about 1970. At that time the feed conversion ratio for pigs was 3.70 and it is thought to have been improving at around one per cent per annum (IRL 83). Therefore, in 1978 the ratio should be around 3.41.

1. Background

Production of pigmeat in Italy has risen considerably since 1970 reaching a total of 863,000 tons in 1977. (1970: 565,000 tons) Over the same period consumption of pigmeat per head of population rose from 12.7 kg. to 20 kg. per year (total consumption in 1977: 1,135,000 tons). In northern Italy production of smoked Parma ham is largely complementary with that of cheese, extensive use being made of whey for fattening. No reliable data for this type of production are available. Table 87 A relates to pork production.

2. Feed Use

Since the early 1970's compound feed use for pigmeat production has risen from 806,000 tons in 1972 to 1,726,000 tons in 1977. (See Table 87A).

Table 87 A: Compound feed production for pigs, Italy, 1972 - 1977.

Year	Production '000 tons
1972	806
1973	1689
1974	2309
1975	2042
1976	1578
1977	1726

Table 87 B gives a percentage breakdown of the composition of the feeds used for fattening pigs and sows.

Source: FEFAC (EC 133)

Table 87 B: Standard composition of pig feed, Italy

Raw material	Pigs up to 20 kg.	Pigs from 20-50 kg.	Pigs from 50-90 kg.	Finishing[a]	Sows
Binder	0.50%	0.50%	0.50%	0.50%	0.50%
Maize	16.00%	30.00%	47.00%	56.30%	36.50%
Barley	36.00%	28.00%	15.00%	18.00%	25.00%
Soya 44	18.00%	17.00%	7.70%	6.00%	7.50%
Fishmeal (65 percent protein)	2.00%	--	--	--	--
Meatmeal (52 percent protein)	1.00%	3.00%	2.00%	--	2.00%
Bran and fine bran	10.00%	10.70%	12.00%	8.50%	12.00%
Lucerne	3.00%	4.00%	4.60%	3.50%	4.00%
Hay	--	--	5.00%	--	5.00%
Carobs	--	4.00%	3.00%	4.00%	4.00%
Molasses	--	2.00%	2.00%	2.00%	2.00%
Skim milk powder	3.00%	--	--	--	--
Whey	4.00%	--	--	--	--
Dextrose	5.00%	--	--	--	--
Calcium carbonate	0.40%	0.20%	0.20%	0.80%	0.70%
Bicalcium phosphate	0.60%	0.30%	0.50%	--	0.50%
Salt	0.50%	0.30%	0.50%	0.40%	0.30%

Note a: To an unspecified final weight.

Source: Prof. Luigi Verini, Consorzio del Formaggio "Parmigiano Reggiano", Reggia Emilia, 1979.

3. Feed conversion

In the view of the Italian national pig producers' association a theoretical feed conversion of 4.2 kg. of cereals to 1 kg. of pigmeat could be obtained with the following breakdown: barley 40 percent, maize 20 percent, oats 10 percent, rye 20 percent and sorghum 10 percent. In practice however, complete feeds containing no more than 60 percent cereals are in general use. This gives one a feed conversion of 4.4 : 1.0 in terms of cereals alone.

PIGMEAT

NETHERLANDS

1. Background

Production of pigmeat has risen by 20 per cent since 1971, reaching 1,081,000 tons in 1977. (See Table 88). The increase has largely been exported, exports rising steadily, to reach 571,000 tons in 1976. Since 1975 consumption of pigmeat has fallen slightly, per head consumption declining from 35.5 kg. in 1975 to 35.0 kg in 1977.

Table 88 : Production of pigmeat, Netherlands, 1971 - 1977

	1971	1972	1973	1974	1975	1976	1977
				'000 tons[a]			
Total production	845	862	885	970	988	1022	1081
Imports [b]	11	16	19	18	30	33	n.a.
Exports [b]	433	448	396	529	543	571	n.a.
Total consumption[c]	423	430	409	462	482	489	483

Notes : a Slaughter weight not including offals

b Includes live animals (in meat equivalent), fresh meat and processed meat.

c. Total consumption is not equal to production plus imports minus exports due to different sources used.

Source: Landbouwcijfers 1978 (NL 105)
Zentrale Markt und Preisberichtstelle (G 69).

2. Feed use

Favourable prices for raw materials used in manufacture have led to a 30 per cent increase in compound feed use since 1970 (See Table 90). The proximity to ports has favoured the use of imported raw materials, especially soya meal and manioc, thus reducing the proportion of cereal used in rations. In 1975/76 cereals , especially maize,

constituted about one-third of the raw materials used, oilseed meals one-fifth, manioc a further fifth. (See Table 89).

Tables 89 and 90 present aggregate statistics for feed use for pigs in the Netherlands.

Table 89 : Raw materials used in compound feed for pigs, Netherlands, 1975/76

Type of Feed	'000 tons
Wheat	55
Rye	20
Barley	204
Sorghum	405
Maize	851
Rice	30
Other cereals	7
Total cereals	1572
Pulses	19
Vegetable fats and oils	5
Lucerne meal	68
Grass meal	43
Tapioca	836
Bran middlings and by-products	571
Corn gluten feed	128
Sugarbeet pulp	46
Molasses	206
Oilseed meals[a]	914
Citrus pulp	63
Fish and meat meal	65
Animal fats	44
Skimmed milk	24
Whey	12
Minerals	124
Other	9
Total	4749

Note: a Soya, groundnuts, sunflower, colza, linseed.

Source: Produktschaap voor Veevoeder. (NL 107).

Table 90 : Total consumption of compound feed, pigs, Netherlands 1970/71 - 1976/77

	'000 tons
1970/71	3833
1971/72	4081
1972/73	4341
1973/74	4515
1974/75	4545
1975/76	4749
1976/77	5047

Source: Landbouw-economisch Instituut, 1978 (NL103).

3. Feed conversion

At present, feed conversion rates for pigs raised from 20 to 100 kg liveweight are around 3.6 kg of feed per kg of liveweight gain. (See Table 91) Although this figure has been derived from results of recorded herds, the high proportion of herds taking part in recording schemes suggests that it can be regarded as broadly representative of the country as a whole. Experimental farms have already reached conversion rates of 2.8:1. In the recorded herds, sows were estimated to consume an average of 1100 kg of concentrates per year and to produce on average 18 piglets. The emphasis in breeding and feeding is laid on improvement in quality, since 70 per cent of the payment is on the basis of meat quality.

As production has become increasingly intensive, average feed conversion has improved from 3.74 kg of feed per kg of liveweight gain in 1970/71 to 3.61 in 1976/77.

Table 91 : Feed conversion, fattening pigs, Netherlands, 1970/71 to 1976/77

Year	Feed per kg carcass weight kg [a]	Feed per kg liveweight gain [b]
1970/71	3.47	3.74
1971/72	3.48	3.71
1972/73	3.55	3.75
1973/74	3.51	3.67
1974/75	3.41	3.53
1975/76	3.44	3.61
1976/77	3.44	3.61

Notes : a Total feed required per kg of carcass weight, including feed for sows and creep feed. Liveweight at slaughter 100 kg.

b Feed required for fattening pigs from 20 - 100 kg liveweight.

Source : Ibid.

For all sizes of enterprise growth per pig per day from 20 - 100 kg liveweight has improved from a liveweight gain of approximately 546 grams per day in 1969/70 to a liveweight gain of 600 grams per day in 1976/77. (NL 103).

There is some regional variation in efficiency. Producers in the eastern part of the Netherlands requiring only 3.40 kg of feed per kg of carcass weight, while the less efficient producers of the south used an average of 3.52 kg of feed per kg carcass weight in 1974/75.

Feed use per animal per day varies by size of enterprise. Since the late 1960's however, smaller producers have become more efficient and the amount of feed given (4.08 kg per day on their enterprises in 1974/75) now corresponds to what is fed on larger enterprises (4.05 kg per day).

Table 92 : Feed use per animal per day depending on the size of the enterprise, Netherlands, 1969/70 - 1974/75

	Feed per animal per day (kg) [a] Enterprise of 20-50 animals	Feed per animal per day (kg) [a] Enterprise of over 50 animals
1969/70	4.28	4.07
1970/71	4.36	4.06
1971/72	4.32	4.06
1972/73	4.42	4.22
1973/74	4.32	4.23
1974/75	4.08	4.05

Note : a Including sows. Feed includes an amount calculated for milk products and sow feed.

Source : ibid.

PIGMEAT

UNITED KINGDOM

1. Background

In the United Kingdom pig production is basically geared to a demand for fresh pork and bacon. To a considerable extent the production of "Wiltshire" sides of entirely cured animals has since World War II given way to differentiated production, the middles being cured for bacon and the quarters left available for the fresh market. Since animal health regulations forbid the import of fresh pigmeat, all demand for fresh pork is still met entirely from domestic production. It seems likely to be some years yet before disease on the continent of Europe is so far eliminated as to permit free circulation of fresh meat between continental member countries and the United Kingdom. Exports of cured pigmeat, especially of bacon and canned hams, from the rest of the Community, are, however, considerable, and highly price competitive, especially from the traditional producing countries, Denmark and the Netherlands, and to a lesser extent Ireland, all of which, but notably the first two, have also benefited from the MCAs inherent in their stronger "green" currencies.

2. Feed use

The volume of production of feedingstuffs for pigs tends, as would be expected, to vary proportionately to the pig population as it in turn responds to the characteristic price cycle (See also Tables 56/57).

Table 93: Production of compound and other processed feedingstuffs for pigs, United Kingdom, 1973 -77.

Type of feed	1973	1974	1975	1976	1977
			'000 tons		
Pig starters	16	27	16[a]	72[a]	132[a]
Balancers[b]	28	29	n.a.	n.a.	n.a.
Concentrates[c]	218	166	169	183	144
All other feeds	2531	2387	1997	2280	2046

Notes: a Great Britain only.

b Balancers denote a composite of protein, minerals and vitamins, usually as a supplement to barley.

c Concentrates denote commercially mixed cereal/balancer compounds, usually processed into pellets or similar form.

Source: Turret (UK 119) pp 25-26, Tables 40 and 42.

The following table provides details of raw materials incorporated in three types of pig feed over a recent four year period.

Table 94: Composition of pig feeds, Great Britain, six-monthly periods, January 1975 - Dec. 1978

Ration	Period	Wheat	Barley	Maize	Other	Total Cereals	Cereal by-products	Animal and vegetable protein	Other	Total
						per cent				
Pregnant lactating sows	Jan-June '75	34	21	1	2	58	28	9	5	100
	July-Dec '75	29	21	-	6	56	25	11	7	100
	Jan-June '76	32	22	2	2	58	23	11	8	100
	July-Dec '76	27	24	7	3	61	22	10	7	100
	Jan-June '77	32	21	6	1	60	23	9	8	100
	July-Dec '77	28	28	1	-	57	24	11	8	100
	Jan-June '78	23	24	1	-	48	32	12	8	100
	July-Dec '78	12	32	1	-	45	29	13	13	100
Pig rearing	Jan-June '75	28	36	7		68	13	15	4	100
	July-Dec '75	28	29	8	1	66	12	17	4	100
	Jan-June '76	28	29	10		66	12	17	4	100
	July-Dec '76	20	22	20	4	66	11	19	4	100
	Jan-June '77	12	23	27	2	64	13	18	5	100
	July-Dec '77	13	22	13	17	65	9	20	6	100
	Jan-June '78	28	25	6	-	59	9	26	6	100
	July-Dec '78	27	28	3	-	59	9	24	8	100
Pig finishing	Jan-June '75	29	32	5	-	66	16	14	4	100
	July-Dec '75	23	30	2	6	61	20	14	5	100
	Jan-June '76	29	27	5	-	61	17	15	7	100
	July-Dec '76	16	29	15	3	63	17	14	6	100
	Jan-June '77	14	33	13	2	62	16	16	4	100
	July-Dec '77	20	33	4	2	59	18	16	7	100
	Jan-June '78	10	41	1	-	52	21	20	7	100
	July-Dec '78	11	36	1	-	48	21	17	14	100

Source: Turret (UK 119) p.37, Table 58.

UKASTA/MAFF (UK 128) for January 1977 to Dec. 1978.

3. Feed conversion

The following may be taken as typical of results achieved by commercial herds in 1977.

Table 95: Feeding required for breeding and fattening pigs[a], Great Britain, 1977

	Concentrates	Feed Conversion
	ton	: 1
Breeding[a]	1.9	
Fattening: pork[b]	0.132	3.3
bacon[c]	0.228	3.5

Notes: a The physical assumptions here are that from each sow 17 piglets are sold per year at 25 kg liveweight. The data for concentrates include creep and weaner feed for the piglets.

b Slaughter at 65 kg.

c Slaughter at 90 kg.

Source: Nix (UK 123) pp. 48-49 and The Scottish Agricultural Colleges (UK125)

These findings are broadly confirmed by the figures obtained from the annual Cambridge University survey of pig units in the eastern part of England, and given in Table 96 .

Table 96 : Feed conversion by pigs, 1968-1977[a].

Year	Feed conversion : 1	Liveweight of pig at slaughter kg
1968	3.82	91
1969	3.90	90
1970	3.85	87
1971	3.70	85
1972	3.72	86
1973	3.72	88
1974	3.75	87
1975	3.62	85
1976	3.52	84
1977	3.50	83

Note: a These data are approximations, having been read off a graph.

Source: Ridgeon (UK 124) p.21

The feed conversion data will fluctuate with the changing balance between pork and bacon pigs. However, it is unlikely that drastic improvements will emerge in the medium term.

BELGIUM

1. Background

Output of chicken meat and eggs, and of the compound feed required for their production appears to have declined steadily since 1973. (See Table 97). 80 per cent of broiler production takes place under contract. The remaining 20 per cent of output is sold on the open market.(B 7)

No data are available for other forms of poultry. The production involved is very small.

2. Feed use

The proportion of cereals used in compound feed for layers and broilers has diminished over the last ten years as the use of manioc has gone up. At present, feeds used will usually contain approximately 40 per cent cereals, 15 - 20 per cent manioc,plus 25 per cent soya meal for broilers and 10 - 15 per cent soya meal for layers. To these percentages must be added, besides the normal mineral and other supplements, a percentage for fish and meat meal and oilseed meal and cake. (B 9). (See Table 97).

3. Feed conversion

Average feed conversion for white-egg layers has reached 2.72 kg of feed per kg of egg. For medium weight brown-egg layers average feed conversion is lower at 3.05. (See Table 98)

Broilers produced in enterprises supplying the open market have a feed conversion of 2.102 kg of feed per kg of growth (up to a live-

weight of 1.701 kg). Average feed conversion in integrated enterprises is lower at 2.123 kg of feed per kg of growth (up to a liveweight of 1.602 kg). (See Table 99). (B 7).

Table 97 : Compound feed production for broilers and layers, Belgium, 1971 - 77

	1971	1972	1973	1974	1975	1976	1977
	'000 tons						
Broilers	296	292	304	274	260	259	264
Layers							
Rearing feed	188	203	177	175	160	151	143
Production feed	626	620	626	622	598	576	533
Total	1110	1115	1107	1071	1018	986	940

Source: de Groote. (B 7)

Table 98 : Feed use and feed conversion, white and brown egg layers Belgium, 1971-1977

	No. of eggs per started hen in 12 months	Total egg production per started hen in 12 months	Feed intake per egg	Feed intake per day	Feed conversion per kg of egg	Average egg weight
		kg	g	g		g
Brown egg layers						
1971	207	n.a.	193	118	3.08	62.4
1972	216	14.1	196	124	3.15	62.4
1973	224	14.8	197	126	3.17	61.9
1974	224	14.7	191	121	3.13	61.6
1975	229	15.4	189	121	3.07	61.4
1976	237	15.9	187	123	3.00	61.1
1977	237	16.4	188	124	3.05	61.8
White egg layers						
1971	199	n.a.	178	112	2.93	60.3
1972	216	16.1	181	116	2.99	60.3
1973	238	16.8	179	120	2.93	60.4
1974	247	16.9	173	119	2.90	60.0
1975	247	16.0	167	117	2.77	59.9
1976	252	17.8	166	116	2.75	60.6
1977	250	18.0	167	117	2.72	61.1

Notes: a 230,000 laying hens
b 410,000 laying hens

Source: ibid.

Table 99 : Feed use and feed conversion, for broilers, Belgium 1971-1977

Freely marketed broilers[a]	Length of production period days	Average final weight kg	Feed conversion kg of feed/1 kg growth
1971	56.3	1.654	2.246
1972	56.3	1.628	2.296
1973	53.9	1.579	2.224
1974	53.0	1.650	2.196
1975	52.5	1.699	2.154
1976	51.1	1.651	2.111
1977	51.3	1.701	2.102
Integrated broilers[b]			
1971	53.2	1.497	2.216
1972	52.9	1.531	2.236
1973	52.0	1.543	2.220
1974	51.0	1.524	2.184
1975	51.1	1.579	2.179
1976	50.7	1.566	2.107
1977	51.1	1.602	2.123

Notes: a 1.30 million broilers surveyed.
b 3.47 million broilers surveyed.

Source: ibid.

DENMARK

1. Background

Between 1965 and 1978 production of poultrymeat rose substantially, (See Table 100) parallel to the increase in consumption per head, which reached 9.6 kg in 1977.

Table 100: Poultrymeat and egg production, Denmark, selected years

Year	Poultrymeat production '000 tons	Egg production '000 tons
1965-1969 (Average)	67	89
1974	95	73
1975	90	75
1976	97	71
1977	103	68
1978[a]	100	68

Note: a July 1977 to June 1978

Source: Landøkonomisk Oversigt, 1978 (DK 11)

Over the same period egg production has declined to the level where domestic consumption is just covered. Per head consumption of eggs rose 4 per cent from the early 1960's to reach 11.8 kg in 1977.

2. Feed use

In line with the development of poultrymeat and egg output,

compound feed production for broilers rose slightly from 1970 while production for layers declined.

Table 101: Production of compound feed for poultry, Denmark, 1970/71-1977/78

	1970/71-1974/75	1975/76	1976/77	1977/78
	'000 tons			
Compound feed for all poultry	585	556	552	550
of which for broilers	214	222	228	234

Source: ibid.

In 1976/77 around 60 per cent of the feed used for poultry consisted of cereals, 33 per cent of protein feeds, the remaining 7 per cent being accounted for by manioc, molasses, bran, grass meal etc.

3. Feed conversion

(a) Layers and broilers

Since 1970/71 feed conversion for both broilers and layers has improved considerably, reaching 2.97 for layers, and 2.05 for broilers to a slaughter weight of 1.474 kg. (See Tables 102/103). Based on a survey of around 35 per cent of egg production (1977/78) the following results were obtained:

Table 102: Average feed conversion, layers, Denmark, selected years

	Unit	1970/ 71	1974/ 75	1975/ 76	1976/ 77	1977/ 78
Egg laying period	days	418	405	446	463	457
Egg production	no of eggs	221	236	264	280	286
Egg weight	g	57.1	58.3	59.1	60.2	60.4
Feed use per hen	g per day	126	119	118	119	120
Feed conversion	kg feed per kg egg-weight	3.49	3.29	3.15	3.05	2.97

Source: Landsudvalget for Fjerkrae (DK 13)

Based on a survey of 35 per cent (1977/78) of broiler production the following results were obtained:

Table 103: Average feed conversion, broilers, Denmark, selected years

	Unit	1970/ 71	1974/ 75	1975/ 76	1976/ 77	1977/ 78
Age at slaughter	days	52	48	46	45	45
Liveweight at slaughter	kg	1.442	1.443	1.470	1.477	1.474
Feed conversion	kg feed per kg liveweight	2.27	2.27	2.12	2.04	2.05

Source: ibid.

(b) Ducks, Turkeys, Geese

For ducks average age at slaughter was 54.3 days at a liveweight of 2.65 kg. Up to slaughter 4.13 kg of feed were consumed. No comparable data exist for geese and turkeys as production only takes place on a small scale. (DK 13) .

POULTRYMEAT AND EGGS

FRANCE

1. Background

Output of chicken meat and eggs appears to have become stabilised between 1974 and 1977. Over the same period there has been a decline in consumption of chicken meat and a rise in the consumption of other poultry, total consumption of poultrymeat per head remaining stable at 14.5 kg per year.

Egg production rose to 1975, but has declined slightly since.

Table 104 : Poultrymeat and egg production, France, 1970 - 1977

Year	Broilers (in tons)	Other poultry[a] (in tons)	Eggs (in tons)
1970	428 000	209 500	651 000
1971	425 000	227 200	641 000
1972	462 000	253 400	666 000
1973	510 000	296 200	712 300
1974	516 000	309 900	727 300
1975	517 000	306 000	760 000
1976	535 000	329 100	747 300
1977	560 700	341 100	737 100

Note: a Turkeys, geese, ducks, cull hens

Source: SNIA (F 38)

2. Feed use and feed conversion

Production of compound feeds for broilers and layers has stabilised since 1974. For other types of poultrymeat, output has risen rapidly since the early 1970's.

Table 105: Production of compound feed for poultry, France 1970-1977

Year	Broilers (in tons)	Layers (in tons)	Other poultry[a] (in tons)
1970	1 116 688	1 196 328	289 798
1971	1 173 012	1 280 454	382 946
1972	1 314 363	1 439 904	517 220
1973	1 460 229	1 629 857	659 171
1974	1 415 850	1 765 822	696 918
1975	1 397 237	1 773 477	640 879
1976	1 493 006	1 761 129	748 774
1977	1 506 478	1 790 424	778 760

Note: a Turkeys, geese, ducks, cull hens

Source: ibid.

Broilers - three distinct types of bird are reared:

(a) For French consumption only: slaughter at 52-54 days at 1.8 kg liveweight. Total quantity of feed consumed, 3.8 kg. Feed conversion is normally 2.05 - 2.10 kg of feed per kg of liveweight gain.

(b) For export only: slaughter at 41-44 days at 1.3 - 1.4 kg liveweight. Total quantity of feed consumed, 2.5 - 2.7 kg. Feed conversion is normally 1.90 kg of feed per kg of liveweight gain.

The feed consists of (per cent):

	cereals (mainly maize)	60-70
	soya	25
	animal fat	3-6
+	some fish and meatmeal	-
	minerals	-

The exact proportions will depend on whether a faster or

slower rate of growth is aimed at.

(c) 'label' poultry. These are luxury chickens raised in lots of 500-1000 as opposed to (a) and (b), which are raised in lots up to 10,000. They will consume 2.3-2.4 kgs of feed each over 10-12 weeks to an end weight of roughly 2.5 kg, consisting of maize, soya, minerals and vitamins. Fish- and meatmeal will not be fed. No figures for the rate of feed conversion are available. (F 40)

Layers - A pullet consumes 8 kg of feed up to point of lay (20 weeks). Average production is 240-250 eggs over the following 52-week laying period, with a feed consumption of 43-50 kgs.

Feed composition (per cent) is as follows:

maize, wheat, bran	50-60
soya	15-18
manioc	10-15
carbonate of limestone	6.5-7.0

In some cases a small quantity of dehydrated lucerne (2-3 per cent) may be fed for pigment. (F 40)

These general results for layers are borne out by field results from one particular breed over five years. In this case feed conversion is higher than the average, which is closer to 3.0 for all types of layer. (See Table 106)

Table 106: Feed use and feed conversion, layers, France, 1972-1977

	No of birds[a] at 22 weeks	Days of production	Average[b] eggweight (g)	Feed conversion per kg. of eggs	No of[c] eggs	Feed intake per day/grms
1972	155718	451	59.8	2.49	329	113.3
1973	375778	443	61.2	2.55	325	115.0
1974	393768	438	60.9	2.56	325	115.1
1975	249586	439	61.1	2.52	327	114.7
1976	534130	426	60.6	2.45	332	112.9
1977	670290	429	60.6	2.39	334	109.8
	Average	438	60.7	2.49	329	113.5

Notes: a Hisex white layers.

b Eggweight is generally marginally higher.

c Calculated on the basis of 63 weeks production.

Source: Euribrid B.V., 1978 (F 21).

Geese - For geese there are no statistics available. Breeding and rearing is generally on a small scale.

Turkeys - There are two main types of production:

(a) For cutting up into parts. Females are reared to at least 12-14 weeks with a liveweight of 3.5 kg at slaughter. Males are reared to 20-22 weeks with a liveweight of 7.5 kg at slaughter.

During production four different kinds of feed are used. The first two contain high proportions of protein, the final two contain less protein. The feed consists of maize, wheat, fat and a higher proportion of soya than is in the feed given to broiler chickens. (60-65 per cent cereals, 30-35 per cent

soya). Feed conversion ratio is 2.8-3 kg of feed per kg liveweight.

(b) For consumption whole. To achieve a weight of 4.5 kg in 12-14 weeks three high energy feeds are fed. The feed contains no meat- or fishmeal and no fat. Feed conversion ratio is 4.5 kg of feed per kg liveweight.(F 40)

POULTRYMEAT AND EGGS

GERMAN FEDERAL REPUBLIC

(WEST GERMANY)

1. Background

Production of all types of poultrymeat rose from an average 204,000 tons a year between 1965 and 1970 to 292,000 tons in 1975/76. Since 1973, however, production of all types of poultrymeat has stablised. (See Table 108). Between 1965 and 1976 per head consumption rose from 6.3 kg to 9.1 kg.

Egg production in 1976/77 was 825,000 tons, per head consumption 287 eggs per year. (See Table 107). Since 1973 the output of eggs has declined considerably as demand has stagnated.

Table 107: Layer numbers and egg production, West Germany, selected periods

	Unit	1965/66 to 1969/70	1970/71 to 1974/75	1973/74	1974/75	1975/76	1976/77
No of layers	Mill head	62.3	58.7	56.5	53.5	51.8	49.2
Production per bird	No of eggs	206	229	232	234	239	244
Net production[a]	'000 tons	752	865	842	853	839	825

Note: a Excluding hatching eggs and losses.

Source: Futterwirtschaft, 1978 (G 56)

Table 108: Poultrymeat production - by type of poultry, West Germany, selected periods.

Type of poultry	Average 1965/66 to 1969/70	Average 1970/71 to 1974/75	1972/73	1973/74	1974/75	1975/76
			'000 tons			
Broilers	102	172	178	174	175	198
Cull hens	60	53	51	59	50	55
Ducks	25	22	24	20	19	17
Geese	6	3	3	3	2	2
Turkey and other	11	19	16	18	18	20
Total	204	269	272	274	264	292

Source: ibid. (G 56)

2. Feed use

In the early 1970's the proportion of cereals used in the rations for poultry rose sharply. Since 1973 cereal use has remained constant. Over the same period compound feed use has declined slightly(see table 109).

Table 109 : Feed use, poultry, West Germany 1971/72 - 1976/77

Type of material	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77
	'000 tons grain equivalent[a]					
Cereals	3621	3940	3599	3528	3645	3799
Potatoes	26	13	11	42	8	7
Other root crops[b]	161	162	147	147	130	76
Concentrates[c]	1326	1202	1109	1139	1130	1075
Milk of all kinds	5	5	4	10	24	45
Total	5189	5322	4870	4866	4937	5002
of which in the form of compound feed	3326	3407	3323	3255	3138	3019
	per cent					
Cereals	70.6	75.0	73.5	73.6	74.1	76.1
Potatoes	0.5	.	.	0.9	.	.
Other root crops[b]	3.9	1.9	4.1	3.8	1.8	1.5
Concentrates[c]	25.5	23.1	22.4	22.6	24.1	22.4
Milk of all kinds	.	.	.	.	0.5	0.9
Total	100.0	100.0	100.0	100.0	100.0	100.0
of which in the form of compound feed	64.7	63.5	69.4	67.9	64.8	60.4

Notes: a See grain equivalent key, Annex 1, page 184.

b Including sugar beet leaf and top, potato and vegetable wastes.

c Bran, pulses, manioc meal, oilcakes, fish and meat meal, feed rice, molasses, lucerne meal and processing wastes.

Source: Futterwirtschaft, 1978 (G 56)

For layers around 80 per cent of the feed consists of cereals, for broilers around 65 per cent. Oilcakes are a relatively low proportion, accounting for 10 and 16 per cent respectively.

Table 110 : Feed composition for poultry, West Germany

Type of animal	Total	Cereals	Oilcakes	Fish and meat meal	Minerals and others
			per cent		
Layers	100	80	10	8	2
Broilers	100	65	16	16	3
Ducks	100	74	12	12	2
Turkey	100	75	11.5	11.5	2
Geese	100	75	12	12	1

Source: U. Hamm (G 69)

3. Feed conversion

The figures for feed use and feed conversion presented in Tables 111 - 115 can be regarded as broadly representative for West Germany as a whole. Regional variations will mainly depend on the size of enterprise prevailing locally.

(a) Layers: As egg production per hen has risen and the amount of feed required has declined, feed conversion has improved from 4.5 to 3.5 kg feed per kg of egg production. Total feed requirement per hen per year is now 40.2 kg and average production is 239 eggs.

Table 111: Feed use and feed conversion, layers, West Germany, selected periods.

	Unit	Average 1965/66-1969/70	Average 1970/71-1974/75	1975/76
Total production of eggs[a]	'000 tons	792	910	883
	Mill eggs	13 787	15 430	14 851
Average egg weight	g	57.5	59	59.5
Average production per hen	No of eggs	206	229	239
Subsistence feed/hen per day	g	78	74	71
Subsistence feed/hen per year	kg	28.5	27	25.9
Feed for production per egg	g	72	64	60
Feed for production/hen per year	kg	14.8	14.7	14.3
Total feed per hen per year	kg	43.3	41.7	40.2
Feed per pullet to point of lay	kg	9.4	8.6	7.8
Proportion of pullets/stock	per cent	80	80	80
Feed required for breeding per hen and year	kg	7.5	6.9	6.2
Total feed per hen and year incl. feed for breeding	kg	50.8	48.6	46.4
Feed use per hen and egg	g	247	212	194
Feed for cockerel	g	16	16	16
Feed use per egg	g	263	228	210
Feed use per kg. of egg production	kg	4.5	3.9	3.5
" " " " " " "	kg unit of starch	3.07	2.66	2.39
" " " " " " "	kg protein	0.61	0.56	0.52
Total feed use	'000 tons (units of starch)	2431.4	2420.6	2110.4
Total feed use	'000 tons (units of protein)	483.1	509.6	459.2

Note: a Including hatching eggs and losses

Source: ibid (G 69)

(b) Broilers: Since the middle of the 1960's increasing rationalisation of production and breeding methods have led to a considerable improvement in feed conversion for broilers from 2.44 kg of feed per kg liveweight gain between 1965 and 1970 to 1.90 in 1975/76. Over the same period the average final weight declined from 1.50 to 1.45 kg and the total feed used for one bird fell from 3.67 to 2.75 kg.

Table 112: Feed use and feed conversion, broilers, West Germany, selected periods.

	Unit	Average 1965/66-1969/70	Average 1970/71-1974/75	1975/76
Production	'000 tons	102	172	198
Feed for parent stock	kg	0.29	0.27	0.26
Feed conversion	kg/kg live-weight	2.44	2.20	1.90
Final weight	kg	1.50	1.45	1.45
Feed requirement for one bird	kg	3.67	3.19	2.75
Feed requirement for one bird including feed for parent stock	kg	3.96	3.46	3.01
Total feed requirement[a]	'000 tons	269	410	411
	'000 tons grain equivalent	260.9	397.7	398.8
	units of starch	183.1	279.0	279.8
	units of protein	53.5	81.7	81.9

Note: a West Germany

Source: ibid

(c) Ducks: Feed conversion for ducks has improved from 3.60 kg feed per kg liveweight gain between 1965/66 and 1969/70 to 2.90 in 1975/76. The total feed requirement per bird is now at 8.21 kg. to slaughter.

Table 113: Feed use and feed conversion, ducks, West Germany, selected periods.

	Unit	Average 1965/66-1969/70	Average 1970/71-1974/75	1975/76
Production	'000 tons	25	22	17
Feed conversion	kg/kg live-weight	3.60	3.20	2.90
Feed requirement per bird	kg	8.46	8.00	7.54
Feed requirement per bird incl. feed for parent	kg	9.13	8.67	8.21
Total feed requirement[a]	'000 tons	97	76	54

Note: a West Germany

Source: ibid

(d) Turkeys: As production of turkeys has become increasingly rationalised, feed conversion has improved to 2.55 kg feed per kg liveweight gain in 1975/76. The total feed requirement per bird to slaughter is 17.3 kg.

Table 114: Feed use and feed conversion, turkeys, West Germany, selected periods

	Unit	Average 1965/66-1969/70	Average 1970/71-1974/75	1975/76
Production	'000 tons	11	18	20
Feed conversion	kg/kg liveweight	2.9	2.7	2.55
Feed requirement per bird	kg	17.4	16.2	16.3
Feed requirement per bird including feed for parent	kg	18.4	17.2	17.3
Total feed requirement[a]	'000 tons	33.7	51.6	34.1

Note: a West Germany

Source: ibid

(e) Geese: Intensive production of geese takes place on a small scale. In such enterprises the average feed conversion was 2.7 kg feed per kg liveweight gain. Feed used per bird was 15 kg.

Table 115: Feed use and feed conversion, geese[a], West Germany, selected periods

	Unit	Average 1965/66-1969/70	Average 1970/71-1974/75	1975/76
Production	'000 tons	6	3	2
Feed conversion	kg/kg live-weight	3.0	2.9	2.7
Feed per bird	kg	15	16	15
Total feed requirement[b]	'000 tons	18.96	9.24	5.69

Notes: a These figures should be treated with caution since a large proportion of geese are still fed in open pasture and accurate figures are not available.

b West Germany

Source: ibid

IRELAND

1. Background

Poultrymeat is produced entirely for domestic consumption. Taking three year averages, output rose by 13 per cent between 1969-71 and 1975-77, but there is no strongly marked upward trend. Over-supply of eggs on the British market has reduced a once traditional export outlet to negligible proportions.

2. Feed use

Table 41 on page 54 indicates a certain cyclical variation in compound feed production for poultry. Since large-scale intensive production accounts for a very small proportion of output of eggs, this is probably to be ascribed mainly to the broiler industry. EEC statistics indicate that the peaks (1973 and 1977) and troughs (1970 and 1975) in poultrymeat output coincide with those in feed production. A *prima face* correlation could therefore be assumed.

3. Feed conversion

As in the case of the other main livestock products, there are no available data, but is is probably that conversion ratios similar to those in the UK (around 2.2:1) are being achieved for broilers.

POULTRYMEAT AND EGGS

ITALY

1. Background

(a) Poultrymeat. Since 1970 production and consumption of poultrymeat have risen fairly steadily.(See Table 116) Italy is now the largest producer of poultrymeat in the European Community,with a total production of around 900,000 tons in 1977. Consumption of poultrymeat per head increased from 11.67 kg per year in 1969 to 15.48 kg in 1976, although consumption of broilers appears to have stabilised. Consumption of turkeys, geese and ducks etc. has risen considerably,from 2.08 kg per head in 1969 to 4.92 kg in 1976. (G 62).

Table 116 : Production[a] and consumption of poultrymeat, Italy, 1969-1976

Year	Broilers		Cull hens		Other poultry		Total	
	Production '000 tons	Consumption per head kg	Production '000 tons	Consumption per head kg	Production '000 tons	Consumption per head kg	Production '000 tons	Consumption per head kg
1969	399	7.40	118	2.19	113	2.08	630	11.67
1970	424	7.80	101	1.86	131	2.40	656	12.06
1971	449	8.16	89	1.61	186	3.39	724	13.16
1972	502	9.12	73	1.32	260	4.72	835	15.16
1973	514	9.27	89	1.61	264	4.77	867	15.65
1974	492	8.82	90	1.61	273	4.89	855	15.32
1975	509	9.05	88	1.57	273	4.85	870	15.47
1976	510	9.03	86	1.53	278	4.92	874	15.48

Note: a Total production including import surplus.

Source: Notizie di Avicol tura, 1977 (I 92).

(b) Layers. After a rise in the early 1970's,egg production and consumption have stabilised since 1974. Of a total

production of 638,000 tons in 1976 approximately two-thirds came from the modern sector and one-third from the traditional sector. Per head consumption was 11.3 kg in 1976.(G62 / I92)

Table 117: Production[a] and consumption of eggs, Italy, 1970-1976

Year	Production '000 tons	Consumption per head kg
1970	603	11.0
1971	576	10.5
1972	600	10.9
1973	642	11.6
1974	623	11.2
1975	625	11.2
1976	638	11.3

Note: a Total production including import surplus

Source: ibid.

2. Feed use

Italy is one of the member countries of the E.C. where, as far as poultry is concerned, there is virtually a dual economy. An important "industrial" sector, employing the most advanced techniques in breeding, feeding and housing operates alongside a large under-developed "mass" of small producers still producing chicken and eggs in traditional farmyard conditions.

Except in Ireland, and to a decreasing extent in France, this contrast is much less marked elsewhere in the Community. In Italy large-scale modern poultry units are mainly concentrated in the North, a few elsewhere, supplying larger cities. To the extent that each of the two sectors is supplied by small and large compounding enterprises respectively, a rough idea of their relative output of chicken and eggs may be obtained from the quantities of broiler and layer feeds produced by the two types of compounder.(Table 118). As might be expected,between 80 and 89 per cent of broiler feed is produced by the larger feed compounders, with whose firms broiler production is, in any case, in large part vertically integrated. In the case of layer feed, the "industrial" compounders account for no more than 40-45 per cent of national output. Between the early

and mid seventies their production of broiler feed was rising almost twice as fast as that of layers. (Table 119).

Table 118: Industrial and non-industrial compound feed production, broilers and layers, Italy, 1974 and 1975

Year	Industrial production for		Production at enterprise level for		Total production for	
	broilers	layers	broilers	layers	broilers	layers
	'000 tons		'000 tons		'000 tons	
1974	2020	1137	300	1443	2320	2580
1975	1992	1081	328	1479	2320	2560

Source: Unione Nazionale dell 'Avicoltura (I92)

Table 119: Industrially produced compound feeds for broilers and layers, Italy, selected years

Year	Production for broilers '000 tons	Production for layers '000 tons
1960	1189	825
1970	1307	915
1971	1446	892
1972	1580	900
1973	1966	1133
1974	2020	1137
1975	1992	1081

Source: ibid. Table

3. Feed conversion

Available data refer, of course, to the "modern" sector.

Broilers slaughtered at 1.6 kg liveweight have a feed conversion ratio of 2.5 kg per kg of liveweight gain. At 1.8 kg slaughter weight, however, the efficiency of the conversion is reduced to 2.55 kg per kg of liveweight

gain. (I 92)

Layers Average production per layer in the modern sector for a period of twelve months from point of lay is 240 eggs. Total feed per egg, including the period up to point of lay is 233.33 grams.

Other poultry No figures are available.

POULTRYMEAT AND EGGS

NETHERLANDS

1. Background

Poultrymeat production rose sharply up to 1973 and has stabilised since. (See Table 120). Domestic consumption is relatively low and has remained at around 7 kg a head per year for the last five years. Roughly two-thirds of the broiler production in the Netherlands is exported, mainly to West Germany. Out of a total broiler production of 292,000 tons in 1976, 190,000 tons were exported.

Table 120: Poultrymeat production, Netherlands, 1970-1976

Year	Broilers	Other poultry
	'000 tons[a]	
1970	258	29
1971	277	26
1972	290	28
1973	302	28
1974	279	26
1975	278	24
1976	298	25

Source: Landbouwcijfers, 1978 (NL 105)

Egg production (see Table 121) has risen steadily since 1970, both domestic consumption and exports increasing considerably. Approximately 40 per cent of production is exported. Per head consumption was 11.5 kg per year in 1976.

Table 121: Egg production, Netherlands, 1970-1976

Year	Production '000 tons
1970	271
1971	255
1972	258
1973	275
1974	283
1975	313
1976	342

Source: Landbouwcijfers, 1978 (NL 105)

2. Feed use

In line with the trends in output since 1970/71, consumption of compound feed by layers has been rising while consumption by broilers has declined slightly.

Table 122: Consumption of compound feed, layers and broilers, Netherlands, 1970/71 - 1976/77

Year	Layers '000 tons	Broilers '000 tons
1970/71	1154	1034
1971/72	1139	1023
1972/73	1178	1052
1973/74	1168	1087
1974/75	1233	951
1975/76	1313	963
1976/77	1353	995

Source: Produktschap Veevoeder (NL 107)

Since 1970 the proportion of cereals incorporated in poultry rations has declined as increased use was made of cereal by-products, tapioca and other cereal substitutes. For broilers the proportion of feedcakes in the ration has remained stable, while for layers there has been a reduction in feedcake use. (NL 107) Table 123 gives a breakdown of feed composition for broilers and layers in 1975/76.

Table 123 : Composition of compound feed used, layers and broilers, Netherlands, 1975/76

Type of Feed	Quantity	
	Layers '000 tons	Broilers '000 tons
Wheat	10	6
Barley	4	
Oats	31	
Maize	638	388
Sorghum	31	73
Total:	714	467
Vegetable fats and oils	2	2
Lucerne meal	30	
Grass meal	1	
Tapioca	59	49
Milling products	81	
Corn gluten feed	31	
Molasses	18	3
Pellets, cakes	192	287
Fish and meat meal	64	73
Animal fats	18	44
Skim milk powder	2	
Whey	1	2
Lysine		0.1
Minerals	97	33
Trace elements	1	1
Vitamins/antibiotics	2	2
Total:	599	496
TOTAL:	1313	963

Note: In per cent the breakdown of the main feeds used would be as follows:-

For layers:

Cereals (mainly maize)	54
pellets and cakes (mainly soya)	15
corn gluten feed	2
milling products	6
tapioca (manioc)	5
fish and meat meal	5
other feeds	5
minerals	7

For broilers:

Cereals (mainly maize)	48
pellets and cakes (mainly soya)	30
tapioca (manioc)	5
fish and meat meal	8
animal fats	4
other feeds	2
minerals	3

Source: Jaarstatistiek van de Veevoeders, 1975/76. (NL 107).

3. Feed conversion

(a) Broilers

There has been a considerable improvement in feed conversion for broilers in the Netherlands over the last seven years. In 1975/76 74 per cent of the enterprises achieved a feed conversion ratio of 2.06 kg of feed per kg of growth. In 1971, only 49 per cent of the enterprises had reached this figure. Table 124 illustrates developments in this sector:

Table 124: Efficiency of broiler production in the Netherlands, 1968-1978

Year [a]	No. of broilers per enterprise	Losses	Feed conversion	Length of feeding period	Final weight	Liveweight gain per day
		per cent	kg/kg liveweight	days	g	g
1968/69	14400	2.2	2.16	52	1310	25.2
1969/70	17900	2.5	2.10	51	1330	26.1
1970/71	18800	2.7	2.07	50	1350	27.0
1971/72	19800	3.5	2.06	49	1370	28.0
1972/73	22400	3.9	2.04	49	1380	28.2
1973/74	22000	3.8	2.04	49	1390	28.4
1974/74	25300	4.0	2.03	48	1420	29.6
1975/76	24000	3.9	1.99	48	1440	30.0
1976/77	26400	3.9	1.98	47	1460	31.1
1977/78	27500	3.9	1.97	47	1460	31.1

Note: a April to May

Source: Landbouw-economisch Instituut (NL 102)

It should be noted that there is some regional variation. The Northeast of the country has the most efficient production, with North Brabant and Limburg provinces lying somewhat behind. In 1976/77 feed conversion in the Northeast was 1.93 kg of feed per kg liveweight gain. In the other two regions the ratios were 2.04 and 2.03 respectively.(NL 102)

(b) Layers

In 1976/77 layers consumed an average 42.3 kg of feed for an average production of 260 eggs over one year. In addition 8.5 kg of rearing feed is used. Since 1970/71 egg production per hen per year has increased by 16 eggs. At the same time the production feed requirement has only risen by 0.6 kg.

Table 125: Feed use and egg production per hen, Netherlands[a] 1970/71-1976/77

Year	Feed consumption kg	Egg production no. of eggs
1970/71	41.7	244
1971/72	41.9	246
1972/73	42.7	248
1973/74	42.4	251
1974/75	43.0	253
1975/76	42.8	258
1976/77	42.3	260

Note: a Based on a sample of 10,000 hens

Source: Landbouw-economisch Instituut (NL 102)

Turkeys, geese and ducks

Since the production of these types of poultry is not large in the Netherlands, no figures are available on either feed utilisation or feed conversion.

POULTRYMEAT AND EGGS

UNITED KINGDOM

1. Background

Although there will always be scope for relatively small-scale egg production close to the larger centres of population, by enterprises delivering direct to retail shops or to doorstep, the bulk of output has for some years past been established in large-scale commercial enterprises. In the case of broilers, production comes 100 per cent from commercial units, almost entirely integrated in four or five large groups. Production of other types of poultrymeat remains largely in the hands of small independent operators, producing for seasonal markets. All the year round turkey production on a relatively large-scale has, however, developed during the past decade. Most of the data given in this section will relate to the larger type of enterprise.

2. Feed use

A long-term decline in total production of feed for poultry (see Table 126) mainly reflects a parallel fall in egg production. Domestic egg producers have had to meet increasing competition from the other EC member countries, from which they were, prior to accession, sheltered by import controls - and by the relative technical and marketing backwardness of most continental producers. Both these constraints disappeared during the 1970s. Demand for broiler, and to a lesser extent turkey, feed has been more closely geared to the cyclical nature of the market.

Table 126: Production of compound and other processed feedingstuffs for poultry, United Kingdom 1973-77

Type of feed	1973	1974	1975	1976	1977
			'000 tons		
Broilers	1074	984	992	1072	1073
Turkeys	417	356	292	360	354
Balancers[a]	12	10	n.a	n.a	n.a
Concentrates[b]	143	94	95	86	71
All other feeds	2357	2054	1970	1957	1876

Notes: a Balancer denotes a composite of protein, minerals, and vitamins used as a supplement, usually for on-farm mixing.

b Concentrates denote commercially mixed cereal/balance compounds, in this case for minority types of poultry production.

Source : Turret (UK 119)

The following table provides details of raw materials incorporated in three types of poultry feed over a recent four year period.

Table 127: Composition of poultry feeds, Great Britain, six-monthly periods, January 1975 - Dec. 1978

Ration	Period	Wheat	Maize	Other	Total Cereal	Cereal by-products	Animal and vegetable protein	Other	Total
					per cent				
Broiler Starter	Jan-June '75	38	21	3	62	5	29	4	100
	July-Dec '75	35	19	10	64	2	29	5	100
	Jan-June '76	31	25	5	61	2	32	5	100
	July-Dec '76	31	25	11	67	1	28	4	100
	Jan-June '77	29	29	7	65	1	30	4	100
	July-Dec '77	39	25	1	65	-	30	5	100
	Jan-June '78	39	19	4	62	-	32	6	100
	July-Dec '78	44	16	4	64	-	30	6	100
Broiler Finisher	Jan-June '75	52	7	5	64	7	23	6	100
	July-Dec '75	48	2	17	67	6	21	6	100
	Jan-June '76	53	8	4	65	6	22	6	100
	July-Dec '76	44	8	20	72	1	21	6	100
	Jan-June '77	45	8	21	74	1	20	5	100
	July-Dec '77	57	6	7	70	1	23	6	100
	Jan-June '78	60	7	5	67	0	26	7	100
	July-Dec '78	60	1	-	61	0	23	6	100
Layer	Jan-June '75	23	27	10	60	14	15	11	100
	July-Dec '75	33	28	5	66	8	15	11	100
	Jan-June '76	27	32	7	66	7	16	11	100
	July-Dec '76	25	37	6	68	6	15	11	100
	Jan-June '77	19	21	27	67	7	15	11	100
	July-Dec '77	33	28	5	66	9	15	10	100
	Jan-June '78	31	26	7	64	7	18	11	100
	July-Dec '78	37	21	5	63	8	18	11	100

Source: Turret (UK 119) p.37, Table 58.
UKASTA/MAFF (UK 120) for July 1977 to Dec. 1978.

3. Feed conversion

The following may be taken as typical results achieved by commercial flocks in 1976/77.

Table 128: Feed use by various classes of poultry, Great Britain, 1977

	Concentrates	Feed conversion
	kg	:1
Egg production[b]	40.5(42.6,45.8)	
Rearing pullets[c]	8.2(7.1,8.0)	
Broilers[d]	4.1	2.2
Capons [a e]	10.4	2.8
Turkeys [f]	19.0	2.6
Ducks [f g]	10.41	3.2
Geese [e]	25.5	4.48

Notes: a The figures given are from Nix, but where those for Scotland are different, the data are in brackets. The first figure is for white egg breeds, the second for brown.

b The date relate to a medium weight bird for a 52 week laying period producing 245 eggs.

c Over a 20-week period per bird reared.

d Per bird sold at 8 weeks.

e Per bird sold at 14 weeks, 3.65 kg for capons and 5.28 kg for geese.

f Per bird sold at medium weight i.e. 7.3 kg.

g Aylesbury ducks sold at 8 weeks weighing 3.3 kg.

Source: Nix (UK 123) pp 50-53 and The Scottish Agricultural Colleges (UK125)

Improvement since the mid-1960s in conversion ratios are reflected in the steadily declining number of days required to raise a bird to the standard slaughter weight (see Table 128). Currently the typical broiler is slaughtered at 4 lbs at 50 days with a feed conversion

of 2.15 (UK 127).

Table 129: Age at slaughter and feed conversion of broilers, United Kingdom, 1956-1975

Year	Age	Feed conversion
	days	: 1
1956	78.6	3.96
1965	62.7	2.39
1966	62.0	2.36
1967	61.2	2.29
1968	59.8	2.13
1969	60.0	2.22
1970	61.0	2.29
1971	60.1	2.32
1972	57.1	2.27
1973	57.4	2.25
1974	56.4	2.29
1975	55.7	2.24

Source: NFU (UK 122)

BELGIUM

1. Feed use

The increase in compound feed use to be expected in Belgium over the next five years is largely a function of the increase in livestock numbers, since the degree of market penetration in the pigmeat and poultry sectors is already very high. Pigmeat demand is expected to rise at 2 - 3 per cent per year, leading to a corresponding rise in livestock numbers and feed consumption. Demand for broiler meat and eggs has stabilised; it will continue at the present level, or possibly decline slightly. The number of dairy and beef cattle will probably remain stable, but a slight increase in compound feed use per dairy cow is to be expected in order to increase yields. Maize silage, with its high yield per hectare, has become more widely used as a means of increasing fodder on small farms where land is a constraint. However, rising costs of maize silage production have recently slowed down, possibly even reversed, this trend. (B8).

The determination of the raw materials used in feed composition is largely dependent on the same factors which prevail in France. (See Outlook section, feed utilisation, France). Belgium is, however, more dependent on imported raw materials such as manioc and soya, since its own cereal producing capacity is constrained by a lack of sufficient land and a poor climate for some crops (e.g. maize, grain).

2. Feed conversion

For pigs the average feed conversion is expected to improve to 3.3 kg of feed per kg liveweight gain over the next ten years (20 - 100 kg liveweight). (B4/1B9).

Feed conversion for broilers and layers has reached the limit of what is technically possible at present, and further improvements are likely to be minimal (B7).

If the trend towards heavier slaughter weights for cattle continues, it seems likely that there will be some deterioration in the rates of feed conversion achieved.

1. Feed use:

Imported feedstuffs, including coarse fodder, now account for 15 per cent of Denmark's total energy requirements and 30 per cent of total protein consumption. Imports of protein feeds as well as cereal substitutes have risen sharply in the last ten years. In 1977/78 imports of manioc and citrus pulp rose to 200,000 tons. Combined with a stagnation in pig production and an increasing area of cereals, this has meant that Denmark has been a net exporter of cereals since 1974. As livestock production has become increasingly specialised and compounders have further penetrated the market, use of compound feeds has risen sharply over the period since 1970. This trend may be expected to continue, albeit at a considerably slower rate. Pigmeat, poultrymeat and egg production are already highly efficient and demand for these products has declined. Any growth in compound feed use which does take place is likely to come from more intensive feeding of beef and dairy cattle using less green fodder and a higher level of concentrates per animal.

In the medium term, little change is expected in the type of raw materials incorporated in livestock rations. The development of alternative protein sources is unlikely to have a significant impact on production. Future availability of manioc will depend on EEC policy in this regard.

2. Feed conversion

The limited evidence available on feed conversion suggests that in line with other Community countries, there is likely to be little improvement in the already high average levels of efficiency for poultrymeat and egg production.

Pigmeat production efficiency will probably continue to improve as the average size of enterprise increases and feeding methods become more rationalised. At present 52 per cent of pigs are in herds of 200 or more compared with 27 per cent in 1970 and this change will undoubtedly continue.

Similarly, more intensive feeding of both dairy and beef cattle as herd size increases, will improve yields and feed conversion, although no enterprise studies exist to confirm this trend.

FRANCE

1. Feed use

In recent years the government has become increasingly concerned about France's dependence on imports of animal feed. Given the present rate of increase in the consumption of protein-rich animal feed, national production will cover only 16 per cent of the country's needs in 1982, compared with 20 per cent in 1976. In 1975 the government initiated a programme to reduce dependence on imported protein feed, aiming to cut protein imports by an equivalent of 675,000 tons of soya meal by 1982. Broadly, this would be achieved in two ways : by increasing domestic production of protein rich feeds, and by reducing the amounts used in animal nutrition. It is hoped to promote the production of lucerne, peas and beans, soya and colza (oil-seed rape). Except for colza, where a harvest of 600,000 tons is expected for 1979 (421,000 tons in 1977),none of the above crops is at present of much significance (F23, F25,F36, F46).

Acreages and yields are both low, and there are technical problems to be overcome before rape can be incorporated without difficulty in animal feeds. Given these constraints the Ministry of Agriculture has estimated that protein imports may be reduced by 145,000 tons of soya meal equivalent by 1982.(F36, F46).

The government also hopes to reduce imports through changes in feed formulation. In particular a compaign to promote greater use of

urea for ruminants has been started. The Ministry of Agriculture has estimated that, in conjunction with increased use of maize silage, substitution of urea could lead to a reduction in imports at present projected for 1982 by 120,000 tons of soya equivalent. In regions where the production of maize silage for cattle is developing most rapidly, attempts are also being made to encourage greater production of grass silage, to be fed in combination with green maize to dairy cows.

Research to preserve the levels of protein in cakes is also being undertaken. For pigs and poultry more widespread utilisation of slaughterhouse by-products, as well as whey and the synthetic amino - acid lysine, is envisaged. All these measures taken together are expected to save 675,000 tons of soya equivalent by 1982. They are to be seen more as a hedge against a possible interruption of imported supplies of protein than as an attempt to cut back soya imports directly. Much of the programme is geared to increasing producers' capacity to make use of alternative sources of protein.

Since 1972 compound feed use for all types of animal has grown considerably (from 9.6 million tons to 12.5 million tons in 1977).

Table 130 : Production of compound feeds for all types of stock

France, 1972 - 1977

Year	Production '000 tons [a]
1972	9,605
1973	10,981
1974	11,135
1975	11,108
1976	12,305
1977	12,492

Note : a Rounded to the nearest thousand tons.

Source : S.N.I.A. - (F38)

The industry expects growth to continue at a rate of between 4.2 and 5.6 per cent per year to 1982. (See Table 131). The extent to which compound feed use will grow for individual categories of stock, depends on the degree of penetration which the manufacturers have achieved. For layers and broilers the market is pretty well saturated. No more than 2 per cent growth per year to 1982 can be expected. In 1974 compounders had acquired 56 per cent of the market for pig feed and are allowing for an annual 2 - 3 per cent rate of growth to 1982. A 30 per cent rise in the level of consumption of compound feeds for both dairy and beef cattle took place during the 1976 drought. This has been maintained and use is expected to continue to rise at a rate of between 4 and 5 per cent a year. An increase in average dairy herd size should also lead to a greater use of feed per cow. As a result total compound

feed tonnage could increase by up to 50 per cent over the next ten years. 40 per cent, as opposed to 20 per cent at present, of the national herd, (albeit a somewhat smaller, though much better structured herd), would then be being fed at least some compounds by the end of the eighties. (F25, F46).

Table 131 : Projections of demand for compound feed in 1980, all types of stock France

		Projections for 1980			
		Low hypothesis		High hypothesis	
	Production in 1974 '000 tons	Rate of Growth per cent	Production 1980 '000 tons	Rate of Growth per cent	Production 1980 '000 tons
Pigs	4232	+ 2 p.a.	5680	+ 3.35 p.a	6485
Layers	1765	+ 2.3 p.a.	2025	+ 4.2 p.a.	2265
Broilers	1415	+ 1.5 p.a.	1550	+ 2.6 p.a.	1650
Other poultry [a]	697	+ 5.3 p.a.	945		945
Dairy cows [a]	919	+ 2 over period	1070		1070
Other cattle [a]	529	+ 3.4 over period	550		550
Sheep, goats [a]	199	+28.0 over period	255		255
Rabbits [a]	531	+ 5 p.a.	700		700
All compound feeds	10400	+ 25 over period	13015	+ 35 over period	14030
Milk replacers [a]	735	+ 5.5 over period	775		775
All feeds	11135	+ 4.2 p.a.	13790	+ 5.6 p.a.	14805

Note : a Single hypothesis only.

Source : S.N.I.A. Based on a study undertaken by the Ministry of Agriculture (F38).

The main change in the composition of the feeds used has been the sharp increase in the use of manioc, to the detriment of domestic cereals. Approximately 450,000 tons were imported in 1978 and imports in 1979 would probably have doubled (F44) had not an agreement been reached in March of that year between the EC Commission.

and Thailand, the main exporter of manioc to the Community to restrict its supplies in future. Community funds will be provided to encourage crop diversification in Thailand, where concentration on manioc production has threatened to create the economic and technical problems associated with monoculture. Higher cereal use resulting from a reduced availability of manioc could, by making pigmeat more competitive with imports from elsewhere in the Community, encourage some increase in domestic production. The increased use of higher protein cereals, especially barley, is also likely to lead to a slight reduction in the soya content of feeds. Agreement by the Council of Ministers to any substantial reduction in support levels for domestic cereals is unlikely, although a prolonged price freeze would by gradually eroding their real value, result in their greater utilisation in feed for all types of livestock.

In some areas, especially the Central-West and Brittany, efforts are being made to increase beef production by raising the productivity of grassland and producing rich grass silage.

2. Feed conversion

Feed conversion for fattening pigs is expected to improve to between 3.3 and 3.4 kg feed per kg liveweight gain over the next ten years. On an experimental basis feed conversions of better than 3.0 have been achieved.

For broilers feed conversion is expected to improve only marginally since production is already highly efficient. Average feed conversion should be around 2.0 in ten years time. Layers may achieve a 5 - 10 per cent improvement in feed conversion on the basis of higher energy feeds.

The great variety of breeds and feeding methods used in dairy and beef production makes it difficult to assess the extent of any improvement in average feed conversion.

OUTLOOK

GERMAN FEDERAL REPUBLIC

(WEST GERMANY)

a) Feed use

Given a continuation of the present trend in demand for pigmeat ie. a 4 per cent rise per year, it is to be expected that total quantities of feed used will rise at approximately the same rate. The composition of the feed used is, however, changing. The use of labour intensive potatoes is declining and the use of own grain, high protein feeds and other concentrates is rising. Potatoes are fed principally on the smaller labour-intensive farm units, as in Bavaria where 60 per cent of the potato harvest is fed to pigs. As the units of production increase in size, concentrates displace potatoes and root crops.

The study by Zeddies and Kleinhanss already noted (G61) of the interregional competitiveness of pigmeat production concludes that, given a continuation of the high demand for pigmeat, production in those areas where own grain is used will have the greatest opportunities for expansion. This trend is borne out in evidence from Hessen, where in 1977 farmers were using 86 per cent cereals (of which 8 per cent were purchased), 1 per cent root crops and 13 per cent other feeds. In areas where compound feeds are relatively cheap, i.e. Northern Germany any expansion will , of course, continue to be based on purchased feed.

The most significant increase in use of high protein feeds is likely to come from the use of such feeds in combination with

maize silage for milk and beef production. Milk production is expanding in cereal growing areas where maize is planted in rotation. More intensive feeding of bulls on maize silage and concentrates is also expected to lead to a rise in concentrate use.

Demand for eggs and broilers has stagnated and no more than 1 per cent growth annually can be expected. Since the manufacturers of compound feed have already acquired a high proportion of the market, little expansion of compound feed use is anticipated over the next five years.

Much research is being undertaken to develop new additives (stabilisers) which enable higher energy fats to be preserved in feed. This research has not had any impact on production to date, but will probably start to become significant within the next five years.

In periods when the soya price is significantly lower than that of feed grains, soya will be used as an energy source, as both soya and feed grains have roughly the same starch content. The extent to which such a substitution takes place is however severely constrained by physiological factors, since the protein to starch ratio cannot be allowed to become too narrow. Increased use of soya in this manner in the future is also dependent on the price ratio soya/feed grains. Given that the soya price in the Federal Republic (cif. Rotterdam) is approximately the same as the price of cereals, it will not be worthwhile using soya for energy since the transportation costs to the producer will make its use uneconomic.

Feed conversion

Production of eggs has been subject to considerable technical improvement over the last ten years. This has been due mainly to a high degree of concentration and rationalisation, closely related to the adoption of new techniques. Assuming a slowing down of the rate of technical innovation there seems likely to be an equivalent decline in the rate of improvement in productive efficiency. The same holds true for broilers, where the introduction of hybrids will probably not have any significant effect. Production of ducks, turkeys and geese is unlikely to increase in importance.

As pigmeat production becomes increasingly rationalised and concentrated on larger farms, feed conversion will improve. It is estimated that by 1982 the average producer will achieve feed conversion rates of around 3.55 and by 1990 this should improve to around 2.90 kg feed per kg liveweight gain (G 74) (G79). Technical progress on experimental stations is likely to be slower than in the past as there are serious problems of meat quality to be overcome in that meat colour deteriorates (G 74).

As the use of compound feeds for dairy cattle has risen milk yield per cow has increased. (See section on feed use page 43). At present average yield per cow is increasing by 60 litres a year. This trend is expected to continue as herd sizes increase and production becomes more efficient and as more cross-breeding, especially with Holstein Friesians, takes place (G 79).

IRELAND

1. Feed Use

Of the total increase in production of compound feeds between 1976 and 1977, 66 per cent was due to dairy cow rations (IRL 80). The producer price of milk has risen steadily, from a rather low base, since Ireland's accession to the EEC, especially as the Irish "green" pound has been regularly devalued. The decline in the consumption of compound feeds by pigs reflects partly the decline in pig numbers, but also the increased availability of whey. Given the milk surplus in the EEC, it is probable that the supply of dairy products suitable for pig feed will continue, encouraged by a continuing subsidy on skim milk for animal feed.

In addition to more plentiful supplies of skim milk and whey since 1975, there has been an increase in recent years in the use of manioc imports, 14300 tons in 1977 compared with 2000 tons in 1976. There were also higher imports of low quality feed products, such as grain screenings, rice byproducts and grape pulp. As far as manioc is concerned, future availability will depend on EEC policy. As has been mentioned elsewhere, this will tend to discourage any further increase in imports. In any case, the 14300 tons imported into Ireland in 1977 represented only one per cent of total cereal use.

With regard to future developments in the type of raw materials incorporated in livestock rations, it is probable that these will closely follow trends in the United Kingdom (see page 175). The pace of development of alternative protein sources is likely to be similar in the two countries, having insignificant effects in the medium term. Undoubtedly, the most important change affecting the demand for compound feeds will

continue to be their increased use in the dairy sector. However, given acceptance of the restrictive price policy on milk proposed by the Commission, this will not be as dramatic as during the past five years.

2. Feed conversion

It is not to be expected that adequate representative data will become rapidly available. No work appears at present to have been initiated by government agencies to monitor feed use in commercial farm enterprises. Most feed compounding firms are operating on too small a scale to employ the necessary research staff. This could, however, be a possible field of future activity for some of the larger co-operatives, perhaps in collaboration. As far as conversion ratios actually being achieved are concerned, these are likely, in the limited number of large scale pig and poultry units, to be little different from what is already common in some other parts of the Community. The national average will probably fall a good deal short of this level for some time to come.

OUTLOOK

ITALY

Feed Use

Italy is a net importer of milk, beef and pigmeat. Only in the north does there exist a potential for significantly increasing the country's degree of self-sufficiency in any of these products. If price policy in the milk sector becomes stringent enough to reduce the Community's overall surplus, any fall in the real price level, either through freezing normal support prices or applying a'co-responsibility'levy to deliveries to dairies, or both, will tend to work against an increase in self-sufficiency for milk and consequently against any increase in concentrate use by the more efficient large-scale and cost-conscious dairy farmers of the Po river basin. Similarly placed farmers producing beef from feedlots, on the other hand, will continue to aim at securing a larger share of the national market. But this will involve an extension in the use of maize, particularly in silage form, grown on farm rather than of purchased concentrates. The rate of expansion of compound feed for pigs that has occurred during the 1970's is unlikely to continue. Within the generally cyclical pattern of demand an upward trend will, however, be maintained. The close connection between pig production and the by-products of cheese making in northern Italy will always constitute a major constraint on cereal use.

Demand for compound feeds for poultry and egg production will also remain concentrated in the north and round a few large cities elsewhere. Some increase in per head consumption of industrial chicken must be expected especially with the gradual spread of modern methods of food distribution and retailing. But as long as economic conditions permit (and even when they might normally be expected not to permit) Italian preference for beef and veal

will constitute a check to the sort of spectacular expansion in poultrymeat consumption seen in other countries.

Feed conversion

The limited evidence available suggests that there is still considerable scope for improvement in feed conversion for both poultrymeat and egg production. In general, production has not as yet reached the levels of efficiency achieved in the remainder of the Community, but can be expected to improve rapidly in the medium term.

Beef production on feedlots cannot be expected to show any significant improvement in feed conversion ratios achieved, but production on smallers farms will probably continue to improve slowly.

OUTLOOK

NETHERLANDS

1. Feed use

In 1975/76 purchased feeds accounted for 62.1 per cent of total feeds used for livestock in the Netherlands. (See Table 12). In the last decade this proportion has been rising as a consequence of the strength of the guilder, low transport costs and efficient compounders. Given the maintenance of the present price ratios between cereals and imported feeds this growth in the use of imported feeds can be expected to continue. In 1978, for example, the Netherlands imported 4.2 million tons of manioc.

The strongest rise in the use of compound feeds will probably continue to be for cattle feed. Feeding of young bulls with concentrates and maize silage is expected to increase as production becomes more specialised and more intensive. Larger quantities of concentrates per dairy cow to increase milk yields, will also raise overall concentrate use as long as the favourable ratio of milk prices to concentrate prices holds. For pigmeat, maintenance of the present high level of exports and domestic demand will ensure that compound feed use rises at roughly 3 per cent per year. Poultrymeat and egg production has stagnated and no significant expansion of compound feed use can be expected in a market which the compounders have almost entirely penetrated. Overall, therefore, imports of manioc, soya, cereal by-products, etc. will continue to rise, but at a slightly slower rate than in the past ten years.

2. Feed conversion

Better breeding, feeding and housing practices are expected to lead to a steady improvement in feed conversion efficiency for pigs. Boer-Ivema (NL110) estimates that by 1988 the average producer should achieve a feed conversion ratio of approximately 3.0:1.

As herd size increases and production becomes more intensive, feed conversion ratios achieved in beef production are expected to improve slightly. Precise estimates are not obtainable, but it is thought that any improvement in feed conversion is likely to be offset by higher slaughter weights.

Poultrymeat and egg production is already highly efficient. No improvement in feed conversion is anticipated for broilers and any gain in conversion efficiency for layers is likely to be insignificant.

UNITED KINGDOM

1. Feed use

It will be seen from Table 58 that certain raw materials, for example, manioc (cassava), maize glutenfeed, dried beet pulp, pulse crops, dried forage, and citrus pulp, which are used extensively in some other member countries, are not even listed for Great Britain. It was suggested by Sturgess (UK 130), writing in 1974, that under his projected price ratios for the late 1970s, manioc would replace cereals to a small extent. This represented a reversal of earlier forecasts made by Sturgess and others that the use of manioc would significantly increase - a view encouraged no doubt by the huge increase in grain prices at the time. The growing use of manioc as a cereal substitute has been causing concern not only to Community cereal producers, notably in France, but also to the EEC Commission in Brussels, which foresees the building up of costly grain surpluses as a result. The continued use of such substitutes will depend partly upon their price relative to those of cereals and partly upon the continued freedom of entry into the EEC. The Commissioner for Agriculture, Mr. Gundelach, on a recent visit to Thailand was able to secure some limitation to Thai exports of manioc pellets. The re-export to the United Kingdom of manioc imported into West Germany and the Netherlands will also be discouraged in future by a decision of the Commission that it shall no longer attract an MCA. This has been providing a subsidy to the German and Dutch exporters. A second potential development in livestock rations is the substitution of some fat for cereals in high energy diets. These fats take the form of tallow fatty acids and vegetable oils and may be included in the form of fat-filled milk powder. However, with increased automated feeding systems and mechanical handling of concentrates on farms, the physical characteristics of the concentrate pellet are of great importance and tend to constrain the

straightforward least-cost linear programming ration mix.

In England and Wales there tends to be substitution between wheat and maize as one of the cereal bases for rations. However, in Scotland, which is predominantly an area of excess demand for wheat and maize and one of excess supply for barley, there tends to be much less variation in wheat and maize usage.

Finally, there may be changes in the sources of protein in animal feeds in the United Kingdom. Over the past five years the use of soyabeans, and meat and bone meal have risen, while that of groundnut and fishmeal has declined. There are a few new crops for which there may be some future, e.g. oilseed rape, sunflowers, lucerne, triticale, soyabean, lupins and evening primrose. Some of these crops are already established, albeit on a small scale, oilseed rape and lucerne for instance, but the others remain a novelty and some may never get beyond this category. Over a five year period to the early 1980s it is unlikely that any of these newer crops will replace imports of soyabean as important sources of protein. Moreover, it now appears that manufacture of synthetic proteins is running into increasing difficulties, and lack of easy availability will discourage their use in processed animal feeds.

The future use of total feedingstuffs will be tied to the livestock populations which utilise them. Bansback (UK 116) has concluded that for the period 1979 to 1985 there is likely to be a growth in breeding cow numbers in both the beef and dairy herds, and a simultaneous growth in carcass weights at slaughter for fat cattle. Both of these trends ought to increase the consumption of feedingstuffs. Pigmeat production is expected to go up by 6 per cent by 1985, compared with 1977, with a larger breeding herd (910,000 as compared with 880,000). Over the same period poultrymeat production is expected to rise by a total of

9 per cent. Taken together, those predicted trends in livestock numbers and in meat production should, in the absence of very dramatic changes in technology, assure a rising consumption of feedingstuffs.

2. Feed conversion

There are a number of factors, almost impossible to quantify, which may have some effect over the next five years on the efficiency of feed utilisation by livestock. With dairy cow feeding practices there are important changes being introduced, which may have an important impact on feed utilisation and milk production. Two new systems of feeding have recently been introduced on a commercial scale following development work carried out by the School of Agriculture at Aberdeen. These are the complete diet and selective free-access systems. In the former, cows are presented with a homogenised mixture of all dietary requirements on an *ad lib* basis. In the latter system, forages and concentrates are available separately and of different qualities. Cows are grouped in both systems by yield or by stage of lactation and allowed unrestricted access to both feeds of the quality appropriate to their group. Both systems, therefore, allow the cow to express its potential for milk production by allowing high food intakes to be achieved in early lactation and controlled intake in the later stages; control being exercised by altering the proportions of forage and concentrate dry matter in the total intake. For the complete diet system, the rations might be as follows 12.0 to 12.5, 11.0 to 11.5, and 10.0 - 10.5 MJME[a]/kg DM for early, mid and late lactations respectively. In both systems silage is likely to provide the bulk of the forage. Work currently under way at the Grassland Research Institute, Hurley, is concerned with identifying the constituents of good quality silage. The implications of success are that there could be a reduced dependence on cereals, but particularly on imported proteins. Whether this research is fruitful or not, the

a. Megajules of metabolisable energy.

outcome of using the complete diet system as compared with traditional practices is that digestibility is improved, feed intakes tend to be as much as 15 per cent higher, and yields raised correspondingly by 900 litres per lactation. In commercial practice it appears, however, that some of the claims for the complete diet system based on research and development may have to be modified. For example, a survey by the Agricultural Development Advisory Service (ADAS) (UK 120) of 32 farms in 1977-78 arrived at a number of conclusions, including the following: first, there is a high intake of dry matter, metabolisable energy and crude digestible protein, especially over the early period of lactation; second, there is only a slight increase in milk yield; third, more concentrates per unit of milk output are used, but these are lower cost concentrates; fourth, milk is of higher quality; but, fifth, the economics are such that the herd is no more profitable in terms of margin over feed cost than conventional systems.

On the beef side, the efficiency of feed utilisation depends to some extent on the breeds used in the beef herd. These change in response to fashion and to economic factors. A trend back to Aberdeen Angus bulls will tend to diminish feed efficiency. A trend to Charolais or Simmental will improve it. At present breed improvement is increasing feed utilisation efficiency by 0.5 per cent a year. Other variables which enter into the scenario are improved conservation practices, the better use of straw and hay crop residues, and the microsination of cereal feeds. This last process is an attempt to improve cereal digestibility by the use of ultrasonics. It is unlikely, however, that over the medium term any of these factors will alter substantially the current trends towards improved feed utilisation, which is around 2 per cent per annum, from changes in feed technology of this kind (UK 129).

Outlook

Given the highly efficient production methods at present employed for poultrymeat and egg production, it is unlikely that there will be any drastic improvements in feed conversion efficiency in this sector in the medium term.

Pigmeat production efficiency will probably continue to improve at the same rate as in the past five years.

GRAIN EQUIVALENT KEY

The key is based on the net energy value of the commodity expressed in terms of units of starch in relation to the net energy value of grain. For the principal products used in animal nutrition the values are as follows:

One ton of product equals	grain units
Grain (wheat, rye, barley, oats)	1.00
Maize, rice	1.00
Buckwheat	0.80
Bran	0.70
Potatoes	0.20
Maize wastes	1.00
Potato flakes	1.00
Sugar beets	0.25
Dried beets	0.70
Feed sugar	1.00
Molasses	0.60
Green and silage maize	0.16
Pulses (all kinds)	1.00
Oilseeds (Rape, Linseed, Poppy)	1.70
Oilcakes (all kinds)	1.00
Soya pellets	1.00
Green matter	0.45
Hay	0.40
Clover or lucerne hay	0.50
Lucerne meal	0.50
Hops	7.00
Vegetables (all kinds)	0.15
Tapioca meal	1.00
Tapioca wastes from starch production	0.80
Fish meal	1.00
Meat meal	1.00
*Whey	0.50
*Skim milk	0.10
Skim milk powder	1.00
*Whole milk	0.80

* One hectolitre of product

Source: Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten, 1978 ( ).

Products included under green fodder,(Table8, page 10).

A : Areas for which production figures are not available.

P : Areas for which production figures are available.

West Germany

A : Serradella, sainfoin, vetches, sweet lupins, etc., grazing including alpine pastures, rough grazing, litter meadows.

P : Temporary and permanent meadows and pastures, clover and mixture, lucerne, green maize and maize silage.

France

P : Purple clover, lucerne, sainfoin, common bird's foot trefoil, other seeded meadows, temporary meadows, and pastures, green maize, other annual green fodder from arable land, natural hay meadows, permanent meadows and pastures, common, alpine pastures, productive heathland.

Italy

A : From 1976: Green fodder from arable land and permanent grassland.

P : Green maize, green fodder in one-crop or mixed cultivation excl. root crops, clover, lucerne, sainfoin, sweet clover, other seeded meadows in onecrop or mixed cultivation, natural meadows with various kinds of plants, permanent meadows and pastures.
From 1976: temporary pastures.

Netherlands

A : Other green fodder, clover, and lucerne.

P : Temporary meadows and pastures, permanent meadows and pastures, green maize.

Belgium

A : Other green fodder and mixture, permanent pastures, incl. unsignificant temporary pastures.

P : Green maize, clover, lucerne, temporary meadows with ray grass and other kinds of plants for mowing, permanent meadows for mowing.

Luxembourg

A : Grazings.

P : Green maize, vetches, other fodder plants for producing green fodder, silage and hay; clover and mixture, lucerne, one-crop grass seed, 1- or 2-cut meadows.

Products included under green fodder, Table 8, page 10 Cont.

United Kingdom

A : Green fodder under 5 years old, rough grazings, permanent pastures.

P : Green maize, rape and mustard and other green fodder, clover, sainfoin, lucerne and other green fodder under 5 years old, permanent meadows 5 years old and over.

Ireland

A : First to fourth year's hay, areas cut for silage, temporary and permanent pastures, other green fodder, permanent meadows.

P : All hay from first to fourth year's grassland, silage and from 1973 also temporary and permanent pastures.

Denmark

A : Grass and clover in rotation, lucerne, green maize, other green fodder, meadows out of rotation.

P : Total production of temporary and permanent grassland.

Products included under permanent grassland, Table 9, page 11 .

West Germany

A : Pastures including alpine pastures, rough grazing, litter meadows.

P : Meadows and hay pastures.

France

P : Natural hay meadows and pastures, common, alpine pastures, productive heathland.

Italy

A : From 1976: Permanent meadows and pastures.

P : Permanent meadows and pastures.

Netherlands

P : Total meadows and pastures.

Products included under permanent grassland, Table 9, page 11 Cont.

Belgium

A : Permanent meadows, including unsignificant temporary pastures.

P : Permanent meadows for mowing.

Luxembourg

A : Grazings.

P : 1- or 2-cut meadows.

United Kingdom

A : Rough grazings, permanent pastures.

P : Permanent meadows 5 years old and over.

Ireland

A : Permanent meadows and pastures.

P : No data available.

Denmark

A : Pastures out of rotation.

P : No data available.

Annex 3. Agricultural structure

Table 132: Dairy cow headage and number of holders, EC-9, 1977, (in per cent).

		EC-9	FRG	F	I	NL	B	L	UK	IRL	DK
Average size of headages		12.9	10.4	13.0	6.5	26.9	14.8	18.2	46.2	12.4	19.7
Total -	Animals	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Holders	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1-2	Animals	2.5	2.1	1.6	10.2	0.4	1.2	0.7	0.2	3.4	0.5
	Holders	21.4	14.2	13.6	45.5	7.4	12.2	7.8	6.4	29.2	7.6
3-4	Animals	3.8	5.2	3.1	11.6	0.7	1.9	1.5	0.3	3.2	0.8
	Holders	14.1	15.4	11.7	21.9	5.3	8.2	7.6	3.3	11.5	4.6
5-9	Animals	11.2	18.6	11.5	18.5	2.6	9.2	6.0	1.0	9.7	5.8
	Holders	21.4	28.5	22.1	18.7	10.2	19.7	16.0	6.4	17.8	15.8
10-14	Animals	13.0	20.2	16.9	9.2	4.8	15.4	9.6	1.9	12.0	11.3
	Holders	14.2	17.9	18.6	5.2	10.8	19.4	14.7	7.3	12.8	18.7
15-19	Animals	12.2	16.4	17.3	6.8	6.7	14.7	11.5	2.5	10.2	11.7
	Holders	9.4	10.2	13.5	2.6	10.7	13.0	12.4	6.6	7.6	13.7
20-29	Animals	18.6	20.7	24.4	10.4	17.0	24.5	29.7	7.0	18.7	22.6
	Holders	10.0	9.3	13.3	2.8	19.0	15.5	22.7	13.3	9.9	18.6
30-39	Animals	11.3	9.3	12.4	6.2	17.0	15.6	22.0	8.6	13.1	17.9
	Holders	4.3	2.9	4.5	1.2	13.5	7.0	11.9	11.6	4.9	10.4
40-49	Animals	7.4	4.9	6.4	4.4	14.9	8.5	9.7	10.0	9.8	12.1
	Holders	2.1	1.0	1.6	0.7	9.1	2.9	4.1	10.5	2.8	5.5
50-59	Animals	4.2	1.7	1.4	3.1	11.5	4.1	9.4	9.3	6.0	6.7
	Holders	1.0	0.3	0.3	0.4	5.7	1.1	2.8	8.0	1.4	2.5
60-99	Animals	9.4	1.6	4.6	9.8	18.6	4.1	0.0	28.5	9.9	8.0
	Holders	1.6	0.2	0.7	0.8	7.0	0.9	0.0	17.3	1.8	2.2
100	Animals	6.3	0.4	0.4	9.8	5.7	0.8	0.0	30.6	4.9	2.4
	Holders	0.5	0.0	0.0	0.3	1.2	0.1	0.0	9.3	0.3	0.3

Source : Commission of the European Communities, 1979, (EC 132).

Table 133: Cattle headage and number of holders, EC-9, 1977,(in per cent).

	EC-9	FRG	F	I	NL	B	L	UK	IRL	DK
Average size of the headages	28.4	24.4	30.3	12.2	49.4	33.5	48.8	72.2	30.9	41.8
Total - Animals	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Holders	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1-2 Animals	0.6	0.5	0.3	3.4	0.1	0.4	0.1	0.1	0.2	0.2
Holders	10.3	6.8	6.1	24.6	2.1	7.9	2.7	2.4	2.5	5.0
3-4 Animals	1.3	1.3	0.8	6.3	0.2	0.8	0.5	0.2	0.7	0.4
Holders	10.7	8.9	7.2	21.8	3.0	7.4	5.9	3.6	5.6	4.7
5-9 Animals	4.1	5.0	3.4	13.6	1.2	2.3	1.1	0.8	3.5	1.6
Holders	17.2	17.7	14.9	25.0	8.4	11.1	7.3	8.4	15.6	9.4
10-14 Animals	4.8	6.1	4.7	11.0	1.9	3.0	1.8	1.3	5.8	2.4
Holders	11.5	12.5	11.8	11.4	8.0	8.6	7.2	8.0	15.1	8.4
15-19 Animals	4.9	6.8	5.2	7.8	2.3	3.9	2.2	1.4	6.0	3.1
Holders	8.1	9.9	9.2	5.6	6.6	7.8	6.3	5.8	10.9	7.7
20-29 Animals	10.0	14.7	11.7	8.8	6.0	9.8	5.4	3.4	12.1	8.1
Holders	11.7	14.8	14.6	4.6	12.1	13.5	10.9	10.1	15.7	13.9
30-39 Animals	9.8	14.0	11.7	6.4	7.9	11.7	6.9	3.9	11.1	9.2
Holders	8.1	10.0	10.3	2.3	11.3	11.5	9.8	8.1	10.1	11.3
40-49 Animals	9.1	12.1	11.7	4.0	9.0	11.8	7.7	4.5	9.5	9.2
Holders	5.8	6.7	7.5	1.1	10.0	8.9	8.5	7.3	6.7	8.7
50-59 Animals	7.6	9.6	8.1	4.0	9.6	10.6	8.7	4.7	8.0	9.0
Holders	4.0	4.3	4.6	0.9	8.7	6.6	7.8	6.3	4.6	6.9
60-99 Animals	21.8	20.0	25.9	9.4	30.5	28.2	34.6	18.5	20.9	28.5
Holders	8.2	6.6	10.5	1.5	19.8	12.7	22.1	17.2	8.6	15.6
100-199 Animals	16.6	8.5	14.0	9.7	22.0	13.9	31.1	30.9	16.3	23.8
Holders	3.5	1.7	3.1	0.8	8.5	3.7	11.6	16.1	3.9	7.7
200-299 Animals	4.7	1.0	1.8	4.8	4.4	1.6	0.0	14.3	6.0	2.8
Holders	0.5	0.1	0.1	0.2	0.9	0.2	0.0	4.3	0.6	0.5

Table 133: Cattle headage and number of holders, EC-9, 1977, (in per cent). Cont.

		EC-9	FRG	F	I	NL	B	L	UK	IRL	DK
300	Animals	4.9	0.6	1.1	10.8	5.2	2.0	0.0	16.0	0.0	1.7
	Holders	0.3	0.0	0.0	0.2	0.6	0.1	0.0	2.6	0.0	0.2

Source : Commission of the European Communities, 1979, (EC 132).

Table 134: Pig headage and number of holders, EC-9, 1977, (in per cent).

		EC-9	FRG	F	I	NL	B	L	UK	IRL	DK
Average size of the headages		29.2	34.4	27.7	8.2	160.3	94.1	37.3	195.8	65.6	99.6
Total -	Animals	100	100	100	100	100	100	100	100	100	100
	Holders	100	100	100	100	100	100	100	100	100	100
1-2	Animals	2.4	1.0	3.2	12.1	0.3	0.3	2.1	0.1	0.6	0.1
	Holders	50.0	20.0	53.7	73.3	3.3	14.8	30.4	13.2	27.6	3.3
3-9	Animals	3.3	4.5	4.0	9.1	0.2	0.9	2.8	0.3	1.7	0.5
	Holders	20.7	30.4	21.6	17.1	6.2	15.4	17.4	12.4	21.7	9.0
10-19	Animals	4.3	5.9	4.6	9.7	0.6	1.6	6.6	1.0	4.9	1.7
	Holders	9.2	14.9	8.2	6.0	7.2	10.8	17.4	13.4	24.3	11.8
20-49	Animals	9.4	16.1	8.9	7.7	3.6	6.9	18.3	2.9	6.7	8.5
	Holders	8.8	17.6	7.2	2.1	17.4	19.8	21.7	17.2	15.1	25.6
50-99	Animals	11.8	18.2	10.0	5.4	9.0	11.7	18.1	4.8	4.7	15.3
	Holders	4.9	9.0	3.5	0.6	19.9	15.6	8.7	12.9	4.6	21.4
100-199	Animals	15.6	20.2	14.2	5.1	18.8	17.2	16.7	7.9	5.4	21.8
	Holders	3.3	5.0	2.6	0.3	21.3	11.5	4.3	10.6	2.6	15.6
200-399	Animals	19.7	17.8	22.3	9.2	26.7	20.9	35.5	12.8	76.0	25.3
	Holders	2.0	2.2	2.0	0.3	15.5	7.1	4.3	8.6	4.0	9.2
400-999	Animals	19.6	13.7	24.4	12.2	29.9	24.7	0.0	24.6	0.0	21.5
	Holders	1.0	0.8	1.1	0.2	8.3	4.0	0.0	7.6	0.0	3.8
1000	Animals	13.8	2.6	8.4	29.5	11.1	16.0	0.0	45.6	0.0	5.3
	Holders	0.2	0.1	0.1	0.1	1.2	0.8	0.0	4.1	0.0	0.4

Source : Commission of the European Communities, 1979, (EC 132).

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